Engineering Library

FACTORY

MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

NOVEMBER 1941

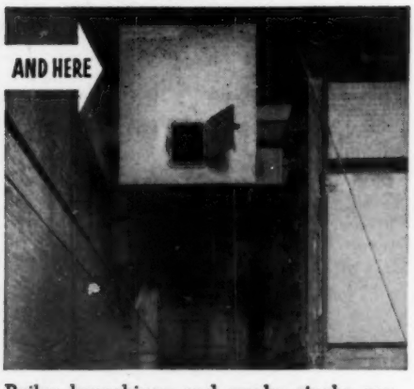
ODLUM on Subcontracting · Page 50

BYERS WROUGHT IRON

IS HELPING PLANT ENGINEERS TO REDUCE REPAIRS AND MAINTENANCE HERE

Biggest job of plant engineers today is keeping production moving . . . and wrought iron is helping them do it in dozens of ways, as these illustrations show. If *you* have any services where corrosion or fatigue are causing premature failures, it will pay you to find out how wrought iron can help you. Our Engineering Service Department will give you actual field service data on the performance of wrought iron in similar applications, on request. Ask, also, for our bulletin, "Wrought Iron for Piping Systems."

Scranton Lace Company, one of the world's largest makers of lace materials, avoids excessive maintenance by using wrought iron for condensate return lines, boiler feed water lines, blow-off lines, heating coils inside plant, drainage lines, and a number of cold water lines.



Boiler breechings and smoke stacks can be a source of continual maintenance headaches if made of ordinary perishable materials. Wrought iron can show records of service up to 50 years, as evidence of its dependability and economy.

Dollars saved by pre-heaters can be lost in excessive repairs and replacements, unless the materials have unusual resistance to corrosion. Here workmen are retubing an air pre-heater with Byers Wrought Iron, a proven material for this service.

Tanks are merely enlarged portions of the piping system, and subject to the same corrosive attack. Where experience dictates wrought iron for piping, good judgment suggests it for tanks, also. A large glass company installed this water tank in '34.

A. M. BYERS COMPANY · PITTSBURGH, PA.

Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

STEEL TUBULAR PRODUCTS

FACTORY
MANAGEMENT AND MAINTENANCE
A McGRAW-HILL PUBLICATION NOVEMBER 1941

ODLUM on Subcontracting · Page 50

Modern war eats up steel faster than even this greatest of steel-producing nations can make it. Capacity at the end of 1942 will reach 89 million tons. Defense needs will take 35, leaving 54 for civilian uses. But even after throwing out our less essential requirements we are going to need 58½ million tons—which means a shortage of close to 5 million tons! Steel photograph on November's full-color cover depicts the always spectacular operation of "tapping a heat." Blast furnace is at Alan Wood Steel Company, Conshohocken, Pa., Kodachrome by Rittase.

A. M. STAEHLE, Publisher • L. C. MORROW, Editor • G. A. VAN BRUNT, LEWIS K. URQUHART, CHARLES B. COATES, Associate Editors • A. H. MOGENSEN, ARTHUR VAN VLISSINGEN, WHITING WILLIAMS, Consulting Editors • H. P. DUTTON, Chicago • C. B. GORDY, Detroit • PAUL WOOTON, Washington • H. E. HILTY, Sales Manager.

Factory Management and Maintenance is a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering. Price 35c a copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y.
Subscription rates—United States, Canada, Mexico, and Central and South American Countries, $3 for one year, $4 for two years, $5 for three years. Great Britain and British Possessions, 24 shillings for one year, 48 shillings for three years. All other countries, $4 for one year, $8 for three years. Cable address, "McGrawhill, New York." Member A.B.P. Member A.B.C. Copyright 1941 by McGraw-Hill Publishing Co., Inc.
Factory Management and Maintenance, November, 1941. Vol. 99; No. 11. Published monthly, McGraw-Hill Publishing Co., Inc. Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42nd Street, New York, N. Y. Entered as second class matter, November 13, 1936, at Post Office, Albany, N. Y., U. S. A., under the act of March 3, 1879. Branch offices: 520 North Michigan Ave., Chicago; 68 Post St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

McGRAW-HILL PUBLISHING CO., INC.
JAMES H. McGRAW
Founder and Honorary Chairman
JAMES H. McGRAW, JR. President
HOWARD EHRLICH Executive Vice-President
MASON BRITTON Vice-Chairman
B. R. PUTNAM Treasurer
D. C. McGRAW Secretary
J. E. BLACKBURN, JR. Director of Circulation
A McGRAW-HILL PUBLICATION

FACTORY
MANAGEMENT AND MAINTENANCE

NOVEMBER · 1941

Time Is of the Essence.....*L. C. Morrow* 49
How I Plan to Spread Defense Contracts *Floyd B. Odlum* 50
British Industry in War.....*A. Beverley Baxter* 57
"We Can Do Defense Work".....*Lewis K. Urquhart* 60
Let's Put the Closed Shop on Ice Until— *Whiting Williams* 62
Conveyor Helps Us Put Idle Space to Work *J. M. Robins* 64
Employee Handbook Answers All Questions *John E. Christ* 66
Piece Parts Control Speeds Selection for Assembly *H. F. Marling* 68
Right Rates the First Time *W. J. Pearse and W. H. Prieskorn* 71
Carter Products, Incorporated.....*John H. Hill* 77
Youth Meets Machine.....*Harold A. Anderson* 78
Management Shorts..... 80
Maintenance as the Editors See It.....*editorials* 82
Oiling by Schedule Keeps Our Machines Running *Nels Swenson* 83
Electric Immersion Heaters Lick Many a Job *H. M. Chatto* 86
A New Way to Insulate Sidewalls and Roofs..... 88
Ten Ways to Make Cranes Work Better, Last Longer *F. M. Blum* 90
Instrument Board Supplies All Control Data *O. E. Bishop* 93
Lighting to Stop Sabotage.....*Davis H. Tuck* 95
Maintenance Shorts..... 98
Data Sheets: Direct Current Control Circuits..... 102
You Want to Know..... 106
What's New in Equipment..... 122
Books 194
Calendar 198
They Say and Do..... 204
Catalog Service 216

CHAMPION *Lamps*

FLUORESCENT

INCANDESCENT

You may select Champion Lamps with complete assurance that you are getting lamps of controlled quality, lasting dependability and the utmost lighting efficiency and economy—lamps in every respect capable of meeting the extra responsibilities of the present emergency . . . Licensed under General Electric Co.'s incandescent and fluorescent lamp patents, Champion Lamps, manufactured to meet the industry's most exacting standards since 1900, cost less than ever before.

Ask your supply house about Champion Lamps

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

Time Is of the Essence

"HURRY, INDUSTRY, HURRY; we must have more production!" is the cry of all official Washington. And the need cannot be disputed, if the job ahead is examined in relation to the job already done.

A $100,000,000,000 armament program now is recognized as a necessity. The United States is admittedly the arsenal of democracy. It is to supply fighting equipment to Great Britain, Russia, China, Dutch East Indies, and South America, while at the same time it arms itself. Unless all this is done at hitherto unheard of speed, a long, long period of conflict is ahead, with no respite from a back-breaking toll for the tools of war. The output to date has been pitifully small when compared to what must be done.

So reasons Washington. And Washington is in position to base its conclusions on more facts than are available to any considerable number of people outside that beehive of defense activity.

But appeals confined to generalities never are very effective. So we try to find out just what it is that Washington wants industry to do. We seek the answer in terms of the obligations of both labor and management.

By diligent questioning, by combining statements garnered here and there, and by then adding a fairly liberal jigger of interpretation, we come away convinced that Washington at present is not at all clear on the obligations of labor, but is fairly definite on what it expects from management.

Yes, there are admissions that something will have to be done about labor, that there are problems to be solved "some day." But that's the net, so far, of that admittedly ticklish problem.

As to management, Washington is inclined to draw from its statistics and reports a fairly serious indictment:

1. That industry is by no means achieving maximum utilization of equipment. Subcontracting, plant conversion, and community pooling of facilities have proceeded at a crawling pace.

2. That three-shift operation is a term rather than an actuality, and that thoroughgoing two-shift operation is no commonplace. The aeronautic and machine tool industries are named as critical in this respect.

3. That many opportunities are lost to build up working forces large enough for successful two- and three-shift operation, by which delivery dates could be advanced.

What Washington wants from management obviously is what FACTORY set forth in its August "National Production Issue" as the program by which the necessary increases in production can be secured. We said there are five things to do:

1. Put all machines to work.
2. Work machines all the time.
3. Use the most efficient methods.
4. Build an adequate working force.
5. Keep the working force at work.

These things management should do, to the best of its ability, whether or not Washington ever becomes definite on what it considers the defense obligations of labor.

This defense job is serious business. There is no visible end to the production that has to come from industry. It is only common sense that every possible machine should be put on defense work and kept running just as close to all the time as possible. The obligation belongs to each plant. And what a showing industry as a whole will make if all the individual plants live up to their obligations. Washington is justified in its "Hurry, hurry" stand. Time is of the essence of each defense contract.

L C Morrow

How I Plan to Spread Defense Contracts

FLOYD B. ODLUM, Director, Division of Contract Distribution, Office of Production Management, Washington, D. C.

VERSATILITY has distinguished the career of Floyd B. Odlum. As president of the Atlas Corporation, he heads the largest investment company in the United States and has taken a hand in the organization or development of many ventures in banking, utilities, transportation, retailing, amusement, real estate, and manufacturing concerns.

Versatility is also a prime requisite of the key defense post—his first in the government—which Mr. Odlum has assumed. To the task of spreading defense orders throughout industry on a scale far exceeding all previous conceptions, he brings a ready understanding of the manifold problems of management in every important field of business endeavor.

Michigan-born, Mr. Odlum is a graduate of the University of Colorado Law School of the Class of 1914. In barely six years he became vice-president of the Electric Bond & Share Corporation, resigning in 1931 to devote all his time to the Atlas Corporation.

Atlas had begun as a family pool, including the $40,000 holdings of Mr. Odlum and his friend and legal associate, George Howard, and their wives. Foreseeing the 1929 market collapse, Mr. Odlum placed the assets of Atlas in cash and liquid form; and in 1930, with resources of $14,000,000, was ready to begin the acquisition of other investment companies. The assets of the Atlas Corporation stand today well above $100,000,000, and include the scores of diversified industrial ventures included in the portfolios of the Sterling Securities Corporation, the Goldman Sachs Trading Company, and the Chatham Phenix Allied Corporation. To improve industry's understanding of the tremendous program he has undertaken in his new job, Mr. Odlum ably outlines his policies for the readers of *Factory* in the following article.

ON THE ONE HAND, big plants fairly choked with gigantic defense orders, new plants rising daily. On the other hand, shutdowns, curtailments—little plants gasping for materials. Men and machines throttled into idleness at a time when crisis cries for every possible pound of production!

That is the situation as we come to grips with one of the gravest consequences of total defense. In "priorities unemployment" we face an economic problem, a social problem, and a military problem. At stake in its solution are not only production—vitally needed today—but the preservation of our civilian morale and our economic stability as well. A key to the success of the whole defense effort may be found in the words of Woodrow Wilson who said:

"The highest and best form of efficiency is the spontaneous cooperation of a free people."

The spirit of cooperation is not bred in idle factories, it does not spring from the hearts of jobless men. Economic stability will be lost if our smaller industries, the very foundation of our industrial greatness, the employers of 60 percent of our working force, are allowed to crumble. We cannot permit the technical organiza-

Odlum brings to his key defense post a ready understanding of management problems

tions of these units to be destroyed. We must not torpedo civilian morale. We dare not forget the admonition of Bernard M. Baruch:

"In the next war we must plan for military victory without economic defeat."

Full recognition was given these facts when on September 4 President Roosevelt, by an Executive Order, created the Division of Contract Distribution of the Office of Production Management. This division replaces the Defense Contract Service and continues its functions on a greatly expanded and intensified scale.

As director of the new division, I have been given a very definite and quite formidable assignment. The specific language of the Executive Order clears the way for an all-out effort "to help the smaller business units of the country obtain a fair share of the defense orders, and to prevent, so far as possible, dislocation of industry and unemployment of workers in plants where production has been curtailed by priorities and materials shortages."

The assignment is, briefly, to move a mountain with a shovel, for we must deal first with $40,000,000,000 in contracts already let, including Lend-Lease, construction, and foreign orders, the greater part of which are piled high on "big industry's" books. This is to say nothing of new mountains of orders accumulating in the contemplated expansion of the total defense program. However, I do not want to make the mistake of saying that there has been no subcontracting. Some of the large companies have done an outstanding job of sharing their work with smaller producers. On the whole, however, there has not been enough subcontracting to use anything like all of the suitable facilities available in the small shops.

Need for Speed

The magnitude of today's defense program, the prospect of still further expansion, and the need for speed have forced upon us a new view of the job that subcontracting must do. Currently we are spending for defense only about 15 percent of our national income, and we are seeking to double the amount of our subcontracting. If we hope to attain the pace of the belligerent nations—which are spending 50 percent of their income and more for war purposes—we must lay the foundations now for a program of subcontracting whose scope is almost impossible to visualize.

At any rate, we of the Contract Distribution Division face a tremendous task. Ours is a huge national organizing job, a selling job, and above all an engineering job of unprecedented proportions. Because we must perforce begin it somewhat belatedly, time is doubly precious. Yet, because a major mistake in policy might set us back any number of irredeemable months, we dare not move rashly.

You, as management men actively engaged in the operation of America's industrial plants, large and small, defense and non-defense, want naturally to know two things: How I propose to go about achieving the objectives of the Executive Order in the shortest possible time, and what you can do to help.

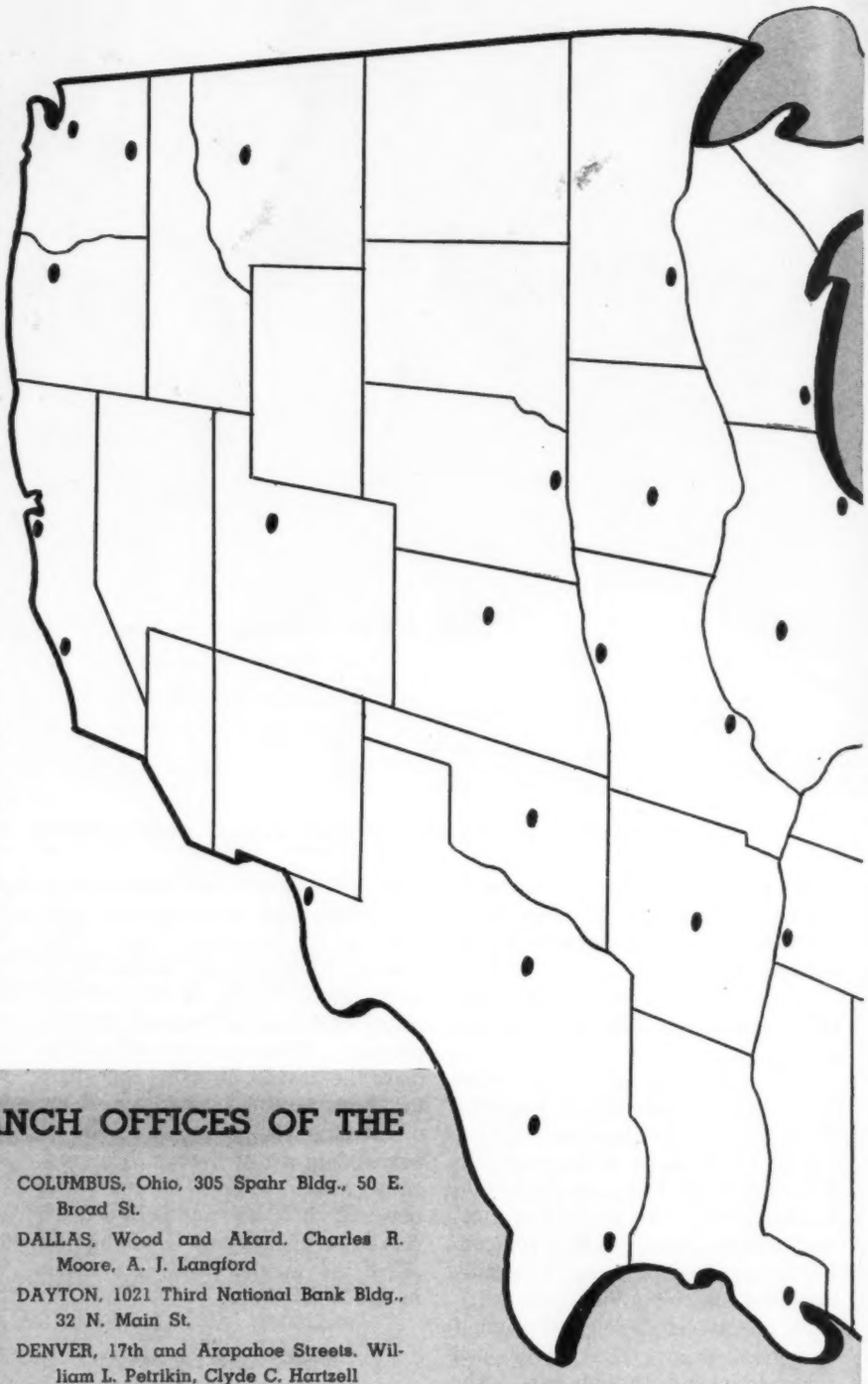
These are some of the steps that have already been taken. We have issued to 56 companies holding major defense contracts an appeal to intensify subcontracting procedures and to appoint key executives solely addressed to this problem. The response has been splendid.

We have begun assembling the managerial manpower so necessary to the expansion of our program of local

services. In this we are availing ourselves of the advice and active cooperation of the Engineering Committee appointed under the terms of the Executive Order. This committee is headed by George S. Armstrong, president of the Association of Consulting Management Engineers. The membership constitutes a blue-ribbon list chosen from among the nation's ablest industrial, management, and production engineers, and includes representatives of the American Society of Mechanical Engineers, the American Institute of Chemical Engineers, and the American Institute of Electrical Engineers.

You will not be surprised when I tell you that I foresee a need on our own staff alone for at least 500 trained engineers. In these times it would seem nearly impossible to assemble such a corps. I am told, in fact, that it *will* be impossible. But we are going to do our best to reach this objective with cooperation from other branches of the government and from industry, and we certainly expect to be successful.

The abilities of these men and of many specialists in business administration, banking, and allied lines will be utilized to the fullest extent. Most of them will see service in the field.



BRANCH OFFICES OF THE

ALBANY, State Bank Bldg., 75 State St.*

ATLANTA, 104 Marietta. Frank H. Neeley, W. C. Cram, Jr.

BALTIMORE, Lexington and Calvert Streets. W. F. Roberts, G. W. Creighton

BIRMINGHAM, 18th and Fifth Ave. North. Edward Lee Norton, L. F. Geohegan

BOSTON, 30 Pearl St. Albert M. Creighton, Edward V. Hickey

BUFFALO, 212 Traders Bank Bldg. John T. Lenehan, Thomas J. O'Rourke

CHARLOTTE, New Liberty Life Bldg. Frank H. Cothran, Francis E. Field

CHICAGO, 230 S. LaSalle St. William Homer Hartz, Thomas S. McEwan

CINCINNATI, 804 Union Trust Bldg. Clifford Wright, Clifford Schulte

CLEVELAND, E. Sixth St. at Superior Ave. George C. Brainard, Charles Terry

COLUMBUS, Ohio, 305 Spahr Bldg., 50 E. Broad St.

DALLAS, Wood and Akard. Charles R. Moore, A. J. Langford

DAYTON, 1021 Third National Bank Bldg., 32 N. Main St.

DENVER, 17th and Arapahoe Streets. William L. Petrikin, Clyde C. Hartzell

DES MOINES, 505 Crocker Bldg.

DETROIT, 160 Fort St. West. Clarence Avery, Warren H. Clark

EL PASO, 351 Myrtle St. W. R. Blair, L. A. Wilke

HARTFORD, Phoenix Bank Bldg., 805 Main

HELENA, Park and Edwards Streets. J. E. O'Connell, R. E. Towle

HOUSTON, Texas Ave. and Caroline St. R. Lee Blaffer, I. M. Griffin

INDIANAPOLIS, Circle Tower

JACKSONVILLE, 504 Hildebrandt Bldg. George W. Simons, Jr., Charles C. McCubbin

KANSAS CITY, Tenth St. and Grand Ave. Kenneth A. Spencer, R. W. Webb

LITTLE ROCK, Third and Louisiana Streets. Charles L. Thompson, Alfred M. Lund

LOS ANGELES, Tenth and Olive Streets. W. S. Rosecrans, H. M. Craft

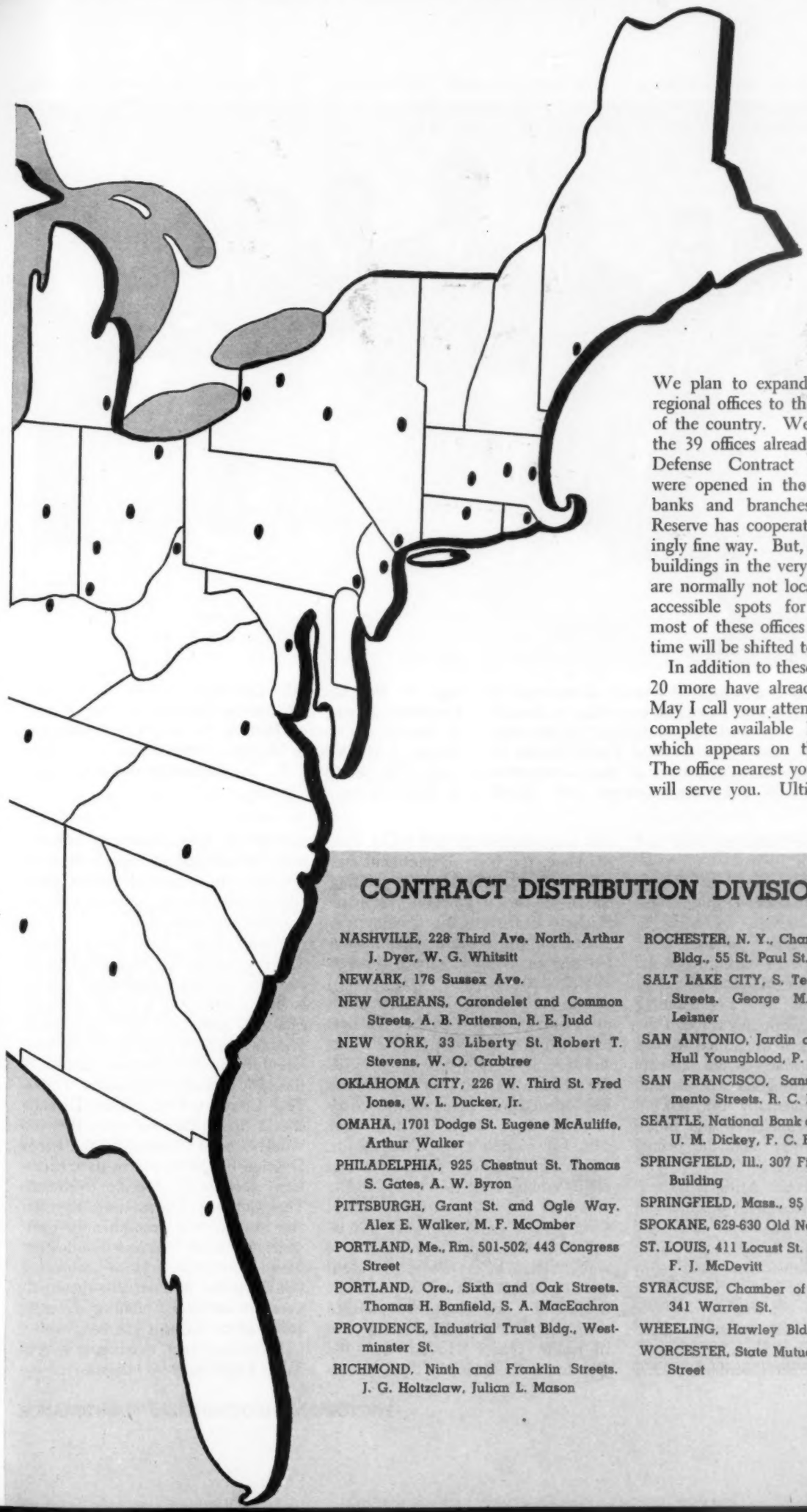
LOUISVILLE, Fifth and Market Streets. Charles W. Allen, Prentiss M. Terry

MEMPHIS, Third and Jefferson Streets. Jesse O. Norfleet, Arthur M. Field

MILWAUKEE, 1124 First Wisconsin National Bank Bldg. Clifford E. Ives, Deputy Manager

MINNEAPOLIS, 240 Rand Tower Bldg. Roger Shepard, H. C. Timberlake

*First man named in each city is coordinator, second is manager. Where no names are given, appointments are still to be made.



We plan to expand our network of regional offices to the farthest corners of the country. We have taken over the 39 offices already opened by the Defense Contract Service. These were opened in the Federal Reserve banks and branches. The Federal Reserve has cooperated in an exceedingly fine way. But, because the bank buildings in the very nature of things are normally not located in the most accessible spots for small business, most of these offices in the course of time will be shifted to other locations.

In addition to these 39 offices, some 20 more have already been opened. May I call your attention to the most complete available list up to date which appears on these two pages? The office nearest you is the one that will serve you. Ultimately the total

CONTRACT DISTRIBUTION DIVISION, OPM

NASHVILLE, 226 Third Ave. North. Arthur J. Dyer, W. G. Whitsitt

NEWARK, 176 Sussex Ave.

NEW ORLEANS, Carondelet and Common Streets. A. B. Patterson, R. E. Judd

NEW YORK, 33 Liberty St. Robert T. Stevens, W. O. Crabtree

OKLAHOMA CITY, 226 W. Third St. Fred Jones, W. L. Ducker, Jr.

OMAHA, 1701 Dodge St. Eugene McAuliffe, Arthur Walker

PHILADELPHIA, 925 Chestnut St. Thomas S. Gates, A. W. Byron

PITTSBURGH, Grant St. and Ogle Way. Alex E. Walker, M. F. McOmber

PORTLAND, Me., Rm. 501-502, 443 Congress Street

PORTLAND, Ore., Sixth and Oak Streets. Thomas H. Banfield, S. A. MacEachron

PROVIDENCE, Industrial Trust Bldg., Westminster St.

RICHMOND, Ninth and Franklin Streets. J. G. Holtzclaw, Julian L. Mason

ROCHESTER, N. Y., Chamber of Commerce Bldg., 55 St. Paul St.

SALT LAKE CITY, S. Temple and E. State Streets. George M. Gadsby, J. M. Leisner

SAN ANTONIO, Jardin and Villita Streets. Hull Youngblood, P. E. Locke

SAN FRANCISCO, Sansome and Sacramento Streets. R. C. Force, W. M. Hale

SEATTLE, National Bank of Commerce Bldg. U. M. Dickey, F. C. Bold

SPRINGFIELD, Ill., 307 First National Bank Building

SPRINGFIELD, Mass., 95 State St.

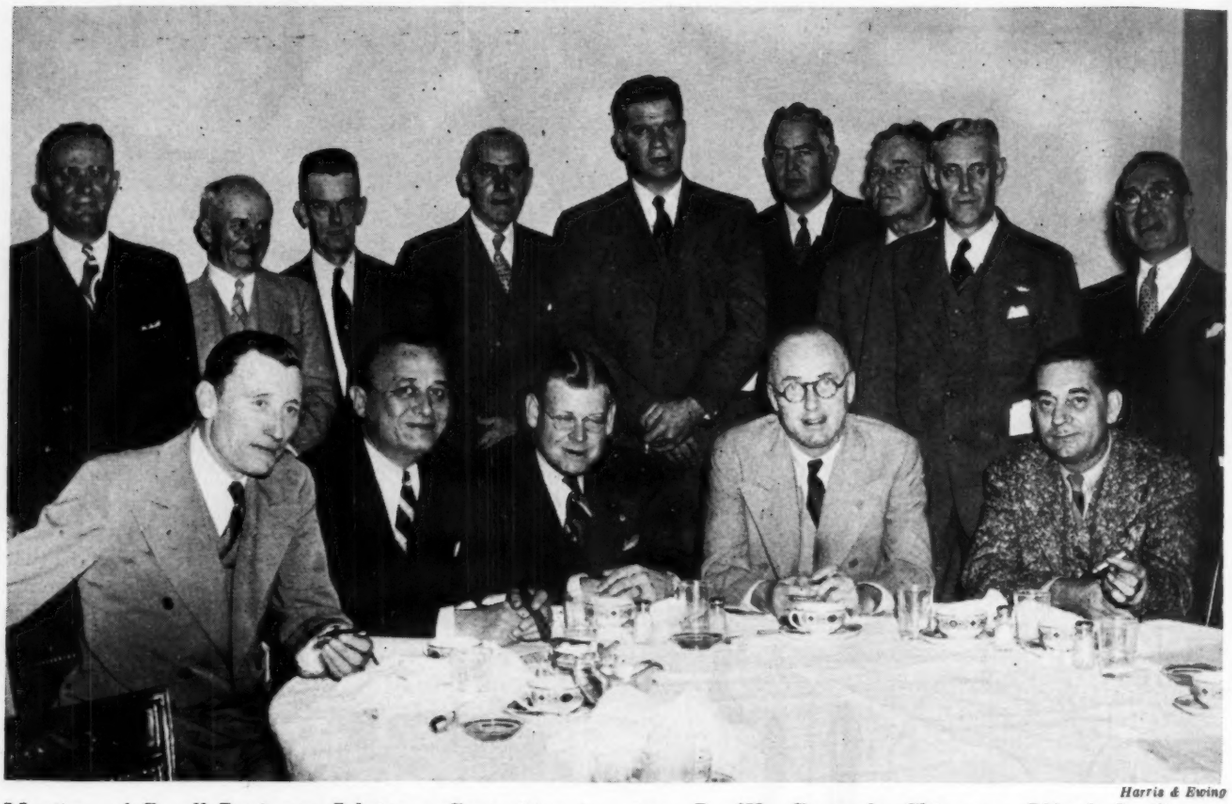
SPOKANE, 629-630 Old National Bank Bldg.

ST. LOUIS, 411 Locust St. Harry B. Wallace, F. J. McDevitt

SYRACUSE, Chamber of Commerce Bldg., 341 Warren St.

WHEELING, Hawley Bldg., 1025 Main St.

WORCESTER, State Mutual Bldg., 340 Main Street



Harris & Ewing

Meeting of Small Business Advisory Committee to discuss the part small business can take in the defense program. Seated, left to right, I. L. Johnson, Berkeley, Calif.; Ben Abrams, New York; Walter W. Finke, Minneapolis, Chairman of the Committee; Floyd B. Odlum; W. B. Connell, Kansas City. Standing, P. W. Grassel, Chicago; Alfred I. Gaunt, Methuen, Mass.; T. J. Storke, Richmond, Va.; Harry C. Keiner, Richmond Hill, N. Y.; Boyd Bridgewater, Akron; J. H. Wilson, Wichita Falls, Tex.; D. R. Yarnall, Philadelphia; A. D. Kennedy, Atlanta; and S. Alva Moog, St. Louis

number of these branches, large and small, may reach 200.

Meanwhile the Army, the Navy, and the United States Maritime Commission have moved vigorously to extend subcontracting in accordance with the terms of the Executive Order. The Contract Distribution Division, never forget, is not a purchasing agency. It can work only through the supply branches of the armed services upon whom so much of the ultimate success of this program will depend. Ours is fundamentally the task of expediting the contact of large industry, small industry, and the federal purchasing branches.

As I say, subcontracting is no new thing to our government procurement agencies. The demand for its intensification, however, has presented them with new problems which, I am happy to say, they are acting promptly to meet. In this connection, the War Department has set up, at the direction of Brig. Gen. H. K. Rutherford, an Army Contract Distribution Division under the charge of Lt. Col. Ray M. Hare; the Navy Department has moved to create a corresponding liaison service on a nation-wide basis through Rear Admiral Charles W. Fisher; and the Maritime Commission has created a similar service through W. H. Lalley.

The Navy Department now sends to Contract Distribution Division branch offices daily notice of all bids and awards of $50,000 or more in the local areas. The War Department has instructed its procurement offices to divide large awards so that other than low bidders may participate; to weigh earlier delivery dates as a factor in valuing bids; to require bidders on orders of $50,000 or more to state what percentage of the work will be subcontracted, and to make this a consideration in the award of orders; and to withhold machine tool deliveries in cases where the required work could be done by existing tools in nearby plants. In addition, the Quartermaster General's office has instructed its field officers to broaden their distribution of orders, favoring —within the limits of certain price ceilings—areas that are distressed by priorities unemployment.

Arrangements have been made whereby certain communities, which are suffering from distressed general labor conditions as a result of shortages of materials and consequent priorities, can be certified to the Services for prompt remedial treatment through specially negotiated orders. The Contract Distribution Division checks these situations when they are brought to its attention by the Labor Division of OPM, and in its certification recommends specific treatment. The Contract Distribution Division also studies and recommends treatment for whole distressed industries when a community labor problem is not the prime trouble. For these purposes the division is building a competent staff as fast as it can be done.

Following such certification the War Deparment is empowered to

negotiate contracts at prices up to 15 percent more than the lowest quotation received or the last price paid; to place trial orders on a cost-plus-a-fixed-fee basis; to place contracts with responsible defense associations or corporations organized by manufacturers or industries in the certified category; and to eliminate, when necessary, the requirements for bid or performance bonds. I shall tell you more presently of some cases in which such action has been taken.

Legislation on which we have been working recently will have to be passed before the Navy can go as far as the Army in granting special treatment to certified situations.

Our Objectives

From what I have told you I believe you can see something of the direction in which I am moving. My line of thought follows that which I outlined in my press conference of September 26. At that time an analysis of our objectives suggested three principal courses of action:

1. Actively and affirmatively breaking up, through the purchasing divisions of the government, the larger units of contracts and assisting in the process of subcontracting.

2. Finding a way to get the large prime contractors in the country to intensify as a policy the passing out of as much of that work as possible to the smaller units.

3. Organizing and mobilizing these small manufacturers so that we shall know what they can do, and show them in turn how they can help us and help themselves.

That third point opens up a vast research job on which we have also embarked. It appears that the measurements of the thing that we call small industry have never been accurately taken. Small industry may include 200,000 plants or even more, a large part of which have some capacity for defense work. To facilitate this vast research and mobilizing job we have also enlisted the services of our Small Business Advisory Committee, headed by Walter W. Finke of Minneapolis, president of the United States Junior Chamber of Commerce. This committee will help us in many other ways as well.

So much for the principal steps already taken. Before I detail some of our further plans, allow me to philosophize a little on the things I have already learned in this job. I must ask you to remember that I am new to the ways of government. What I have sought most earnestly is a policy that will enable me to use to the greatest advantage the various forces in government and industry that come to bear in some way on this problem. What I want most to do is to *democratize* defense, to make all industry conscious of the little plant's big role in the national effort.

These things have already become evident to me: (1) Certain legal obstacles to subcontracting will have to be cleared away by legislation to relax some of the formalities of government purchasing procedure and to permit the suspension of competitive bidding in additional instances; (2) some provision will have to be found to put a certain premium on subcontracting in cases where its adoption involves increased cost—certainly producers are entitled to a guaranty against serious loss in any subcontracting venture which they may undertake for primarily patriotic reasons; (3) the government must stand ready to use its broad existing powers to force any recalcitrants into line—I hope, of course, that these powers will never have to be used.

Job for Engineers

As for the Contract Distribution Division, its job is primarily an engineering one. Its personnel must be hand-minded people who talk the language of production. They must be equipped to analyze facilities and to bring prime contractors, subcontractors, and procurement officers together locally *at the scene of the job*. They must also unceasingly promote the *idea* of subcontracting in terms of its benefits to the national welfare and to the individual.

Yet great as our staff may grow, great though the cooperation of the armed services may be, the Contract Distribution Division can never be more than a spark plug in the national subcontracting machine. The power, the will to produce by subcontracting, and the actual execution of the job will depend on industry itself. To management let me say that the determination to spread defense work far and fast must be yours. The prime contractor must be generous, receptive, patient. The subcontractor must be aggressive, resourceful, persistent. Both must be so devoted to the principle of subcontracting as a means of national and personal economic salvation that they will readily submerge all shortsighted interests.

It is vital that the prime contractor act vigorously to move out of his plant the simple, easy jobs that the little fellow can take on quickly—not the complex, costly "headaches" in which a single misstep may bring ruin to the little fellow and in which, in any event, there is little reward. The subcontractor, on the other hand, cannot expect to get business if he merely waits, hat in hand, for someone to hand him an order requiring little ingenuity, imagination, or effort. He must be prepared to fight for his business, to hunt high and low, to figure closely, and to exercise all the engineering skill that he ever addressed to his worst peacetime problem.

Lubricating Forces

Between the two, the procurement officers and Contract Distribution Division representatives should move as active lubricating forces, clearing away obstacles, relaxing unnecessary tolerances and specifications, simplifying paperwork, and selling the cooperative spirit to both parties in the bargain with might and main.

Next to the farming-out of simple orders, one of the most beneficial policies that big management can pursue will be the assignment of engineering talent to the task of *seeing subcontracting through*. This is all-important. A representative of the prime contractor should live in the subcontractor's plant, if need be, until the first job is done. A good idea, now more widely practised, is for prime contractors to take supervisory personnel from subcontracting plants into their own organizations for a time until they are thoroughly familiar with the manufacturing procedure. Unless these things are done—done well and thoroughly—much needless delay, much loss, much spoiled work may result.

When, finally, real subcontracting hits its peak through the wise application of these principles, I and my staff and the armed services will be receiving the full-time assistance of

countless thousands of skilled engineers and production men whose names will never appear on the payroll of our division.

For the future, it seems to me, we may find three principal approaches to the subcontracting problem that will prove to be major factors in its solution. Of the utmost importance, I think, will be the industry committees formed to implement various policies of OPM.

One of these committees, that formed by the household washer and ironer industry, is playing an interesting role in the first test of an entire industry's ability to organize itself for remedial defense production. Early in the game, this industry was notified by what was then the Office of Price Administration and Civilian Supply of a serious curtailment in its output. Instantly recognizing the danger of widespread unemployment, the industry committee set up an engineering subcommittee which, in cooperation with the old Defense Contract Service, made a survey and found 17 items of defense manufacture to which the industry's facilities were suited. As the first industry certified to the War Department, the 34 manufacturing units of this class are well on the way to a successful solution of their problem.

We see in this an example of the way in which business men, fully familiar with one another's problems, can be called together to submerge individual interests in a spirit of complete cooperation.

Another important approach is that of certification of a community. Manitowoc, Wis., the first city so certified, is being given all the special attention that we and the armed services are currently permitted by law to extend. As a result, distressed industries there are now working away on defense contracts. I shall not dwell in detail here on this well-publicized development except to point out that it calls into play the cooperative efforts of all the governmental agencies affecting it, including the OPM Labor Division, the War Department, and ourselves, as well as the local manufacturers and allied groups.

First industry certified — washing machine, on October 21. Contract, a $12,000,000 one for anti-aircraft gun mounts. Placed with Nineteen Hundred (St. Joseph, Mich.), Apex (Cleveland), and Easy (Syracuse). All three to subcontract to 31 other companies in the industry

★

Communities certified — Grand Rapids and Greenville, Mich.; Easton, Ga.; Manitowoc—the first to be certified—and Ripon, Wis.; Newton and Kellogg, Fla.; and Mansfield, Ohio

★

Special exhibit trains will tour the country beginning November 10. One will travel the Eastern Seaboard; second will swing through the Middle West; third will go to the West Coast

A third approach is that of "pooling" industrial resources by groups of companies in part of an industry or in a local area. Such an arrangement often enables the participants to do collectively what they could not do with their individual equipment. Much good work has been done in this field by manufacturers in whom the spirit of initiative and private enterprise is decidedly alive. Much more can be accomplished along this line and it will be a prime concern of our regional offices to foster this procedure by every means at their command. An excellent case-history, which well repays study, is the account of the "mother hen" plan worked out by the Cleveland Ordnance District as described in the August National Production Issue of FACTORY (p. 77).

Now I believe I have given you the most extensive answer possible at this date to your two questions, what am I seeking to accomplish, and what can you do to help? As you can see, our policy does not embrace any one specific course of action but *every* course that has been proved useful or that we *think* may prove useful.

Traveling Clinics

Within the next month you will find the Contract Distribution Division pushing harder than ever to get the national subcontracting ball rolling. We shall continue to open new offices as fast as we can get good men to staff them. We shall sponsor defense clinics by the scores and hundreds because I believe that one tangible exhibit, placed on display with a competent man standing by to explain it, will do the work of a carload of blueprints in half the time. And half an hour's talk between a defense contractor and a prospective subcontractor, across a clinic conference table, is worth tons of correspondence and weeks of traveling. We are sending three traveling clinics, set up in special trains, all over the country, bearing well-arranged exhibits of munitions items and parts for subcontractors to inspect and figure on.

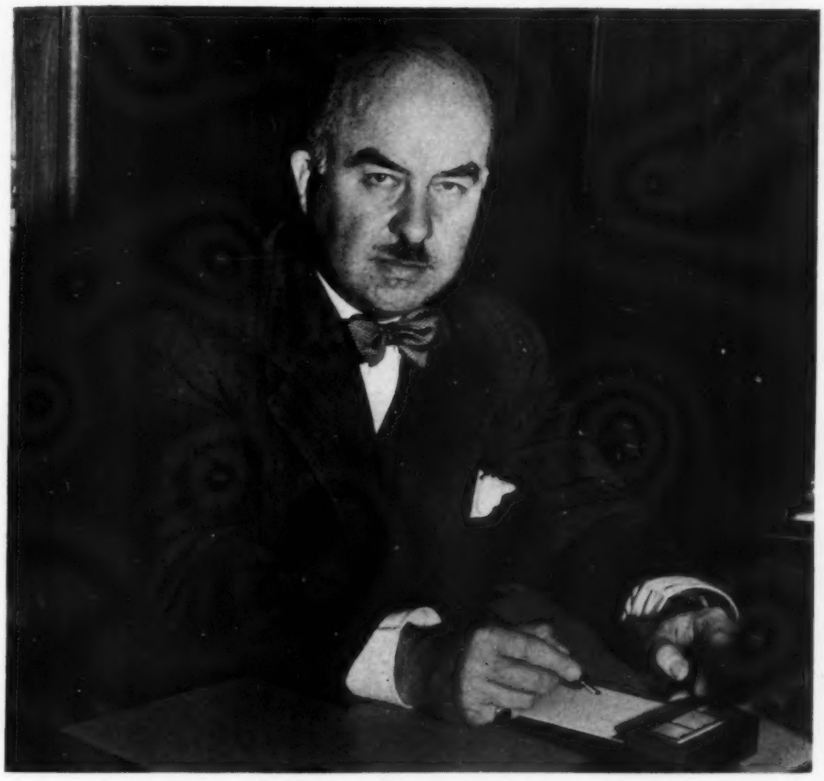
We shall avail ourselves of all the cooperation we can get from the numerous active state and local governmental industrial and defense agencies, from chambers of commerce, from manufacturers associations, and from you. We are getting a late start on this enormous job and I will make you only one promise: We *will do* our *level best*. We know that there will be some small industries for which, in the nature of things, there can be but little help. But I believe that the big problem, the national problem, can be solved once the full energies of creative industrial initiative are, through this program, unleashed.

Let us get together, you and me, so that some day we can make another von Hindenberg say of us, as did that German leader when reminiscently he put his finger on an important World War turning point, and declared: "(America's) brilliant war industry had entered the service of patriotism. *They understood war.*"

British Industry in War

What's happening to industry in wartime Britain. Reactions of industry's three major groups — management, wage earners, and stockholders

A. BEVERLEY BAXTER, Member of Parliament



AN AROUSED DEMOCRACY, we learn from this article, will stand for:

Confiscatory taxation—income taxes ranging from 10 shillings to the pound (50 percent) up to 19½ shillings (97.5 percent) on individuals; excess profits taxes of 80 percent on corporations.

Industrial conscription—in which the government has the power to conscript management and workers, including women.

Compulsory industrial mergers—by which many manufactories of civilian goods are arbitrarily shut down and what is left of their production is consolidated in one or two plants.

Long hours and no strikes—which, for labor, means the virtual suspension of its peacetime rights.

These are policies of a war government that has become "the supreme employer, the sole importer, the controller of shipping and raw materials, and the universal banker."

Canadian-born, A. Beverley Baxter was for many years Editor-in-Chief of the *London Daily Express*. Was appointed Controller of Aircraft Factory Cooperation by Lord Beaverbrook. Is principal political writer for Lord Kemsley's allied newspapers. He wrote this article especially for *Factory*, delivered it the day before boarding the Clipper for England.

THE WAR OF 1939 did not come as a surprise. It had advertised its arrival for about six years, and although there were many who hoped that Germany might achieve her legitimate aspirations without fighting, preparations went steadily on to meet the crisis if it came.

There is a saying that generals always make the mistake of fighting a war with the tactics of the previous one. That may be true of generals as a class (although it would hardly seem to apply to the Germans), but certainly the civil authorities in Britain did not hesitate to look back upon the experiences of 1914–1918 and to learn from them.

World Was Younger

It seems annoying now to recall that in the struggle against the Kaiser's Germany income tax in Britain rose no higher than six shillings in the pound and that level was reached only in the last year of the struggle. There was no serious attempt to control wages or prices so that the factory workers' wages soared to unprecedented heights and greasy profiteers in their glistening Rolls Royces were a particularly unpleasant feature of the British landscape.

In fact so enormous were the profits gathered by certain firms that a retroactive war profits tax was introduced to try and recover some of the swag from the robbers! Many industries suffered, of course, especially those supplying the domestic market and requiring raw materials from overseas, but on the whole it might be said that the unhappy British slogan of 1914, "Business as usual," persisted to an extent to the very end.

Probably Mr. Lloyd George, who was a dominating political figure throughout the war, would contend that by allowing business to keep its independence, he maintained a larger field for taxation and kept the industrial formation of the country stronger for the post-war period. In passing it is interesting to record that government war loans carried 5 percent in-

terest and that the first intention was to make it 6 percent.

The world was certainly younger in 1914 than it is now.

My American readers will at once recognize that a nation that embarks on a war is far more ready to submit to government interference than a nation that is sympathetic to one side without actually becoming a belligerent. Therefore the British government in 1939 had only to deal with a public that realized it was about to engage in a life-and-death struggle against a nation that had been on a total war basis for five years.

British industry and the British public were ready for any measures provided they seemed to be justified and were not merely the capricious edicts of a swollen bureaucracy given sudden gigantic powers.

This was the many-sided problem facing the British government:

1. Avoid the vicious spiral of rising wages and rising prices.

2. Force the nation to subscribe to war loans rather than to spend on non-necessities.

3. Pay for as much of its imports as possible by exports.

4. Insure that no one in industry profited by reason of the nation being at war.

5. Change over the vast bulk of the factories to war production.

6. Avoid inflation.

7. Carry the approval of organized labor in such matters as dilution, woman labor, hours, and the right to strike.

No one will deny that such a program was admirable to gaze upon but not so easy to bring into effect. For one thing Neville Chamberlain failed in his endeavors to form a national government so that labor was outside the administration.

Undoubtedly, Chamberlain should have resigned at the outbreak of war, since his appeasement policy had failed. But like most political leaders he clung to office in the genuine belief that he was indispensable. He was wise enough, however, to take into his cabinet the man who had been in the wilderness for so long — Winston Churchill.

Sir John Simon as Chancellor of the Exchequer gave the nation its first unpleasant shock when, in an emergency war budget, he brought the income tax rate up to 7½ shillings in the pound. Many financial pundits criticized the budget as too harsh, claiming that Simon had exceeded at the very opening of this war the highest level reached at the end of the last. They contended, in fact, that Simon's taxation would simply change the rich taxable fields of British business into a dust bowl. In trying to understand the attitude of the financial Bourbons, it must be remembered that surtax, as well, is paid in an ascending scale on all incomes over £2,000 a year. As the surtax rate was raised at the same

★ ★ ★

"The war against 'consumer spending' went grimly on . . . the government wasted no time in asking for personal sacrifices"

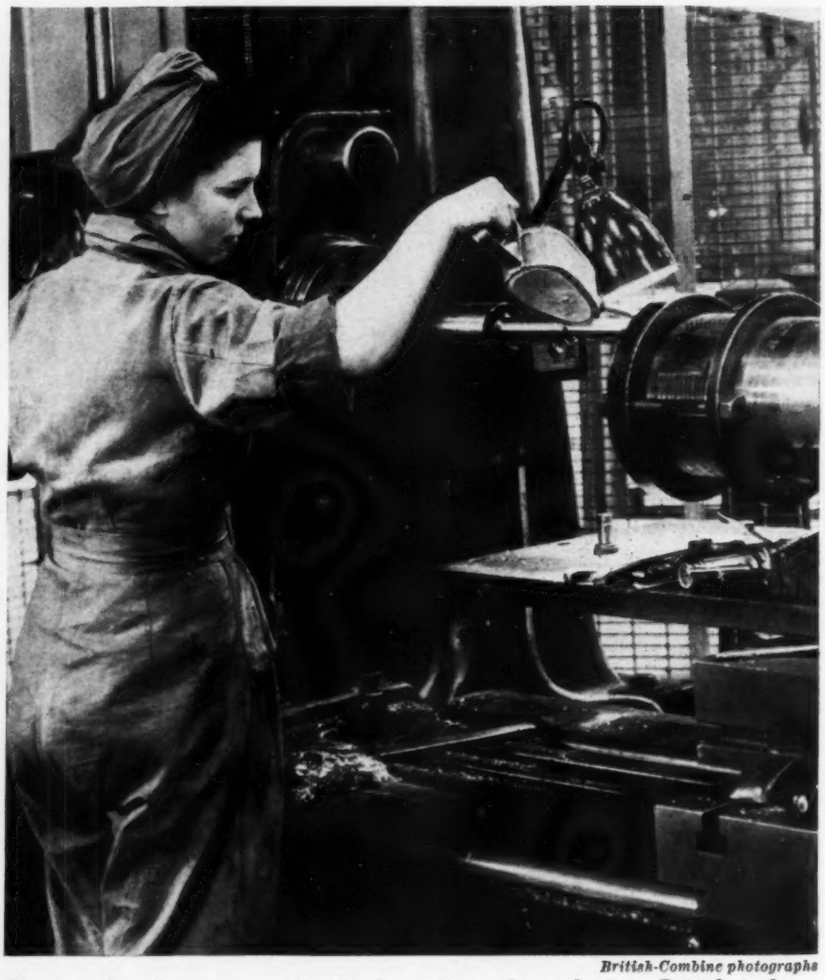
★ ★ ★

time as the income tax rate, you will see that the attrition of the well-to-do classes had begun in earnest.

All this time a battle was going on between the government and what might be called the Keynes school of thought—based on the theories of Prof. J. M. Keynes. The Professor argued that inflation and rising prices could only be avoided by taxing an immense amount of the spending power of the nation out of the hands of the people. Further, he contended, since human nature never altered, the only way to secure this money was to take it at source—in fact to deduct it from the worker's pay envelope. Thus, while income tax and supertax would be reducing the spending power of the well-to-do, a forcible extraction would be having the same effect with the workers' wages.

That some such plan was necessary, no one doubted. The memory of the last war was too green. We recalled that the swollen wages of the workers created such a boom for furniture, pianos, gramophones, and everything else that their manufacturers were able to compete with war industries for their labor.

The government asked Professor Keynes and the Bank of England what figure of national savings would be



British-Combine photographs

Thousands of women and girls have been brought into British industries and are releasing men for service in the actual fighting units

necessary for the first year. They named a total so high that, in their opinion, it could not be even approached by voluntary savings.

The government disagreed and put the London banker, Sir Robert Kindersley, in charge of the national savings movement. This organization, manned entirely by volunteers, was superb. A network of savings committees covered the entire country, and thousands of savings groups were formed in factories and offices and neighborhoods.

In addition, each city and borough in the country was allotted its "war weapons" savings week which stimulated a healthy rivalry and made it all something of a game—which is always the Englishman's ideal. The result was more than gratifying. The total which Keynes had thought impossible was exceeded. In the process Sir Robert Kindersley was made a Peer, but he richly deserved it.

To some extent, therefore, the government had carried out its purpose of reducing spending power, securing necessary millions for war expenditure, and, by creating such a widespread area of savings, insuring a sobering influence on events after the war. In short, this war has made of the British a race of small capitalists—something that deserves more than a passing thought.

For the first few months the war proceeded in a leisurely way, but with

★ ★ ★

"If Henry Ford turned up at the Chrysler plant and said he had been put in charge by President Roosevelt, one might have something of an American parallel"

★ ★ ★

the fall of France the British realized that they were up against a desperate struggle for survival. Churchill formed his government, and at once the new Chancellor of the Exchequer brought in his emergency budget. Income tax was raised to 10 shillings in the pound.

"It is not enough!" shouted the members of the House of Commons, nor were they being humorous. Britain was at last stripped for action and nothing else mattered. The chancellor protested that he could hardly do more. On the highest incomes, he pointed out, the government was taking all but sixpence in the pound. Maisky, the Soviet ambassador, looked down from the gallery with his enigmatic smile. He must have wondered at the narrow margin between communist and capitalist confiscation.

Churchill succeeded where Chamberlain had failed. He persuaded labor to join the government and appointed Ernest Bevin, the trade union boss of Britain, to take on the difficult post of Minister of Labor. Bevin is no fool and must have realized how difficult the transition would prove. From being the champion of labor he was to become its master. No longer would he seek special advantages for his millions of workers but would have to

(*Continued on page 184*)

At first the men in Britain's factories looked askance at the female intrusion, and then accepted it with good humor. Here, some of the women behind the guns in the assembly bay of an ordnance plant

"We Can Do Defense Work"

Fram Corporation uses "sales presentation" to tell how well its mother-hen unit can serve. Technique is one any small plant or group of small plants can use

LEWIS K. URQUHART, Associate Editor, *Factory*

FROM BUTTER TO GUNS is a long jump. But a lot of manufacturers are going to have to make it—or else.

Question is, how?

OPM's Contract Distribution Division is anxious to bring even the smallest of well-equipped metal-working shops into the defense program. Thousands of small plants would like to come in, but don't know the way.

Hence this description of how a group of four small companies (total employees, 729) with nine plants "sold" OPM and the U. S. Ordnance Department on the idea of making full use of their equipment on defense work not in their regular lines. The method—formation of a "mother-hen" unit and study of combined production facilities—involves a technique so simple that any similar group can adopt it "as is" or adapt it with only a few minor changes to a special set of conditions.

Mother hen of this particular unit—i.e., the plant that takes the contract, splits up the assignment, then assembles the pieces—is the Fram Corporation, a leading manufacturer of oil filters, with its main plant at East Providence, R. I. (259 employees), and branch plants at Ann Arbor (136) and Otsego, Mich. (29). Associated with Fram in the original study were Key Manufacturing Company, Fall River, Mass. (18 employees), a wholly owned Fram subsidiary; Mason Can Company, with plants at East Providence (147) and Otsego (19); Bellevue Manufacturing Company, Bellevue, Ohio (121).

Note, first of all, that the nine plants are not all in the same locality. Five are in New England, four in the Middle West. The unit is therefore not a "natural," geographically speaking. But it is a perfectly logical combination, because Bellevue has long been Fram's principal supplier of stampings, and Fram has long bought cans from Mason.

Fram, in short, is primarily an assembler, processing less than 10 percent of the materials it uses. It produces and sells several million dollars' worth of assembled merchandise annually, and has had broad experience in subcontracting, which entails the designing of finished products and all parts used, placing orders with subcontractors, receiving and inspecting several thousand parts daily, and assembling them into finished products.

With this manufacturing background Fram appears to be an ideal mother hen, and just what the doctor ordered for the local office of the Defense Contract Service. So Fram made the study of production facilities, had the data duplicated and bound into an inexpensive 8½ x 11 book, and saw to it that OPM got a copy.

Not, let it be emphasized, that it was a case of Fram's getting a defense contract—or else. Fram had defense contracts for its regular line of oil filters and re-fill cartridges—enough with its non-defense business to keep

Sample page from Fram Corporation's book designed to "sell" OPM on ability of mother-hen unit to take and fill a defense contract. This page lists machines in one of nine cooperating plants

	MACHINE	SIZE	TYPE	MANUFACTURER	IDLE HOURS
27	Mechanical Plating Machine	14"x32" cyl.		Hanson-Van Winkle	16
28	10 Buffing Machines		Double End		16
29.	2 Degreasers	VH-400-#1140			16
30	Tapping Machine		Vertical 2-H-A-P	Haskins	16
31	Heater		Rotary		16
32.	Hand Screw Machine	#6	Auto chuck & bar feed	Warner & Swasey	16
33.	3 Auto Screw Machines	1"	5 hole turret	Cleveland	16
34.	Drilling Machine		Double end horiz. auto	Pratt & Whitney	16
35.	Spot Welder	35 KVA		Taylor Winfield	16
36.	Spot Welder	6 KVA	Model 80	Ace	16
37.	Plain Screw Machine	1¼" back geared	Auto chuck & bar feed	Wood	16
38.	Power Shear	48"	Squaring	Niagara	16
39.	Shear	#6	Alligator		16
40.	Welder	10 KVA	Spot		16
41.	Welder	20 KVA	Spot	Taylor	16
42.	Grinder	1"x26" spindle	Double End Surface	Valley City	16
43.	Drill	25"	Vertical	Barnes	16
44.	Grinder	#2	Surface	Brown & Sharpe	16
45.	Shaper	20"	Crank	Smith & Mills	16
46.	Shaper	16"	Crank	Gould & Eberhard	16

Page 34

Book includes photographs of departments, also of individual machines, in each of the small plants that compose this mother-hen unit. Here, heavy presses at Mason Can Company's Rhode Island plant

welding and cartridge-assembly equipment busy two shifts. Fram's president, Steven B. Wilson, simply figured it part of his duty as a good citizen to work that equipment a third shift if necessary on any defense products OPM might decide the company could make.

"The corporation," quoting from the foreword in the study, "is operating at or near capacity at the present time, but is willing and anxious to manufacture anything of which it is capable for defense needs, even though it means seriously curtailing its present production of non-defense products."

Data for the study were compiled on the basis, not of regular products, but of fundamental machine operations the plants are capable of performing, and of the equipment available to undertake whatever type of manufacturing orders may logically be assigned to the group.

The four companies perform a wide variety of production operations, but none of the plants perform a complete production operation. In order to offer a complete service the cooperating companies have placed their productive capacities, for defense, under the general management of the Fram Corporation.

The study leads off with a summary of combined production facilities, including (1) officer personnel, (2) plants, (3) number of employees, (4) number of shifts now working, (5) how many workers could be employed with present equipment on one shift, two shifts, three shifts, (6) number of shifts could work with available labor, (7) designing and engineering department, (8) list of equipment, (9) number of idle machine hours weekly, (10) power source, (11) shipping facilities, (12) list of important customers, (13) defense orders, (14) list of plants subcontracted for, (15) plants subcontracted to.

Combined facilities include equipment for the following kinds of products and process:

1. All types of steel and aluminum stampings up to 16x16 inches and of 14 to 20 gage.

2. Forming operations up to 74½ x 36 inches and of 16 to 30 gage.

3. Small machine-screw parts.

4. Projection and spot welding.

5. Processing raw cotton into cotton roving.

6. Threading.

7. Chemically treating cotton waste and roving.

8. Cans.

9. Painting, enameling, lithographing, plating (copper, nickel, chrome).

10. Assembly, including several types of assembly conveyors.

Studies of individual plants follow, with complete details. For example, that of the Fram Corporation's plant in East Providence shows 55,000 square feet of floor space in three buildings—a 2-story brick office, 1-story frame stucco factory, 2-story brick warehouse.

Number of employees is broken down into 56 office, 8 engineers and technicians, 8 foremen and supervisors, 10 toolmakers and machinists, 2 skilled workers, 12 semi-skilled workers, and 163 unskilled workers.

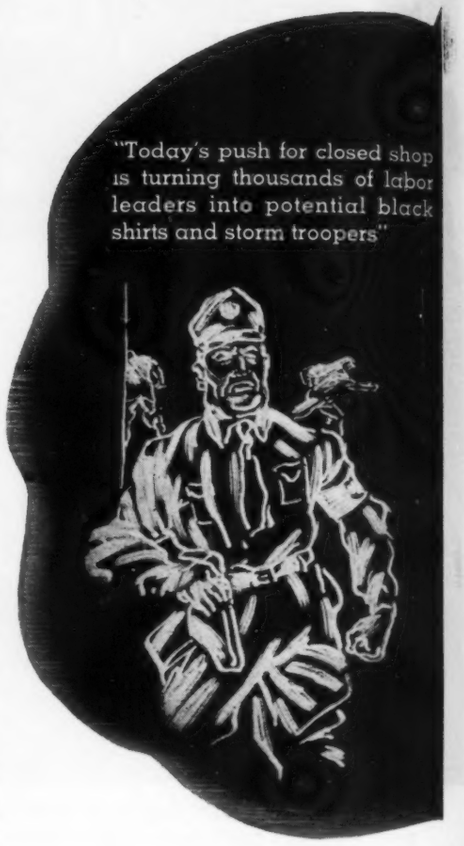
The detailed study of this individual plant shows further that the welding and cartridge departments are

(Continued on page 158)

Let's Put the Closed Shop on Ice Until—

"Out of the mouths of wage earners and leaders and managers can be heard enough words to convince anyone that the defense emergency should not be utilized to establish a permanent closed shop and check-off in America"

WHITING WILLIAMS, Consulting Editor, *Factory*



"I DON'T UNDERSTAND," said an employer who has long operated under a closed shop contract, "why so many managers fight so hard against an arrangement which has brought me peace and stability."

Along with him, the employers of more than 3,000,000 or over one-fourth of the country's organized workers have to date signed similar agreements. In addition it is expected, come spring and summer, that many others will feel compelled to do the same—unless they prefer to risk a strike's stoppage of their defense production plus perhaps the necessity of turning their plants over to the government.

"Compelled?" The word is too strong. Too many managers appear to have "given up," to be awaiting the demands of their embattled union leaders in a state of meek hopelessness bordering on paralysis.

"If the government and all its agencies," they are asking, "has its heart set on a Closed Shop America, what's the use of my resisting?"

It's hard to blame them. After all, their job is to produce the sinews of war. If a host of laws makes all but impossible the effective direction of their workers, why not accept the union leader's promise to bring peace and stability, and let him police his members by firing them off the job if they refuse to obey him?

But all the same I wish that these employers—also a host of legislators and other Washington powers-that-be—could somehow listen in while I talk this matter over with rank-and-file wage earners and also with some of their most thoughtful and far-seeing leaders. If they did, they'd hardly fail to be convinced that the issue is too complex, far-reaching, and vital to permit any employer—or any legislator—to decide it in any mood of either carelessness or the most hopeless desperation.

How the public feels about it is made plain enough by the big majorities registered against closed shop by various polls. Against the check-off, the same public and also wage earners, both organized and unorganized, register still bigger majorities. Most significant, of course, is the recent strike of more than 20,000 hard-coal miners against an increase of their union dues from $1 per month to $1.50 and of their usual $2 annual assessment to $6. This surprising, down-tools protest evidently represents unwillingness to have their money used to further the political ambitions of their leaders. These grimy-handed duespayers thus appear to "get" a certain vital point which both employers and legislators seem to miss—namely, that closed shop, with or without check-off, spells serious danger not only to industry but also, even more disquieting, to our entire political and economic system.

If the Leader Desires

"Closed shop's promised peace and stability," so I was lately told by the thoughtful, experienced head of an important mechanic's union unaffiliated with either AFL or CIO, "can be delivered if the leader so desires. But only at the price of stagnation! For the employer who buys these 'advantages' from the leaders thereby sets them up in politics, there to devote their time mainly, like John Lewis, to efforts to boss the entire political and economic system under which he, the employer, operates.

"Just how? Why, because, without a closed shop contract, any leader is kept on his job of making himself useful to his members. The moment he gets careless, his dues fall off and his job is in danger! But, once he gets a closed shop contract, he is free not only to go into politics, but also to go in with a big 'slush fund' behind him. Today's push for closed shop is turning literally thousands of labor leaders into potential black shirts and storm troopers! These, considering the number of dishonest racketeers in one camp and of disloyal reds and pinks in the other, are just as unprincipled and ruthless as their colleagues abroad for making, if they wish to, our politics as undemocratic, our private employers as powerless, and our rank-and-file wage earners as voiceless, as in present-moment Italy and Germany.

"To be sure, at this moment these new-type political bosses appear less inclined to take over as a Third Party than to frighten Washington into doing what they want it to do, namely, continue to play Uncle Remus's Tar Baby and 'keep on sayin' nothing'!'

"Collective bargaining is most likely to be *collusive* bargaining. That much money handed over each month to the leaders will be too much for 'em"
BLACK LIST
"And what's to prevent them from operating a black list from one end of the country to another? What'll a man who gets too mouthy do then—except starve?"
"Beatings and sluggings are indulged in too often by the racketeers in one camp and the reds in the other to make me want to give 'em the closed shop"
"If I were a worker, I'd call closed shop poison. But since I'm a labor organizer I find it nuts and raisins"

Lord knows, that's quite enough to produce the present closed shop paralysis and general impasse. But if shortly they succeed in using the defense emergency for forcing every organized worker into closed shop and check-off, think what they can do! Multiply an average of, say, $20 per member annually by the present ten or twelve million members and see what a 'slush fund' you get—between *200 and 240 million dollars per year!* Then add to that the sum you get when you multiply that same $20 by the other scores of millions of those other workers who are still unorganized!"

These dollars are now used less by the leaders than is their threat (made recently, according to one Congressman, in "goon squads of three") to annihilate any legislator or other politico who utters the slightest word in favor of fairer labor laws or less prejudiced labor decisions. In any case, more than a few of labor's statesmen have begun to fear that their extremist colleagues are thus sowing seeds sure to bring a crop of laws for depriving their beloved "movement" of its choicest, truest gains. ("The Lord Government giveth, and the same Lord Government taketh away!")

Peaceful Reasonableness

These fears and others even more personal and pointed are sure to be heard by anyone willing to take the trouble to listen to the ordinary wage earner, whether union or non-union.

Ask him, for instance, about the peace and stability promised every employer by the leaders: "Under closed shop every one of your employees gains automatically the right to attend union meetings and thus to make the policies of his union represent the peaceful reasonableness of democratic control."

"This collective bargaining," said a Detroit worker recently respecting that city's most outstanding example of closed shop and check-off, "is most likely to be *collusive* bargaining! That amount of money handed over each month to the leaders will be too much for 'em. The deal will be fine for them and the managers. But what about us?"

"It's already been hard enough," broke in another, "to get attention from the floor. But now it'll be too *dangerous* for a guy to get up and ask any questions. If a member's important enough, he'll likely be bought off by money out of the treasury. If he isn't, he'll just be told to get the hell out—out of the union and therefore out of his job!"

"And what's to prevent them," asked another, "from operating a black list from one end of the country to another? What'll a man who gets too mouthy do then—except starve?"

Exactly such a black list with its promised peace and stability is said by competent observers to have brought the stagnation now blighting the oil fields of Mexico. There the closed shop was first made unavoidable by much the same methods as are now being operated here. As in all such contracts, an "exclusion" clause made it permissible and proper to expel a person on "the request of any three members"—without, of course, the right of appeal to employer, union, or anybody else.

(*Continued on page 160*)

Conveyor Helps Us Put Idle Space to Work

J. M. ROBINS, General Manager, Yankee Metal Products Corporation, Norwalk, Conn.

WHEN WE FINALLY DECIDED that the steadily increasing volume of our business was not just an accident but a definite trend, we started to think about expanding our manufacturing facilities.

We were already using every inch of floor space in the location then occupied, and the only available additional space was on the floor above.

We weren't especially enthusiastic about having to divide our operations between two floors. For one thing, the upper floor would not hold heavy machinery, so that we couldn't possibly move any primary operating department upstairs. That floor would have to be devoted only to lighter work—which meant that every bit of our production would have to flow from downstairs to upstairs and then downstairs again.

But something had to be done, so we finally decided to move the assembly, packing, and shipping departments, and the finished goods storeroom upstairs. All actual fabricating departments, which naturally had to use heavy equipment, were left on the lower floor.

THE EASIEST HANDLING METHOD seemed to be an endless chain conveyor. Fortunately we had previously adopted a standard tote tray to transport semi-finished work through the plant. It was easy, therefore, to design carriers that would hold several of these trays. Parts ready for assembly that come from the finishing departments—painting, plating, polishing—all meet at a central point. Here the conveyor rises almost immediately, traveling upward through a hole cut in the upper floor. Multiple switches are situated at five strategic points. These switches can be used to stop the entire system in an instant, in one of two ways—either so that it is impossible to re-start the conveyor at any point except where it was stopped; or so that it can be started again at any switch.

On the second floor the conveyor continues to rise until it rides level with a platform where parts that are not needed right away are stored for future use. Parts for immediate assembly are allowed to continue on the carrier. About halfway down the room, where the assembly department starts, the conveyor dips again to an easily accessible level. Here filled trays are unloaded and the empty ones are placed on the carriers for their return trip to the fabricating departments. Because this conveying system is continuous, it doesn't matter if a loaded tray happens to be overlooked—it simply goes round again.

Down a spiral chute ride packages ready for shipment. They come from the second-floor shipping room to the first floor, where a roller conveyor carries them directly to trucks. The chute is so designed that there is no danger of damage to the merchandise.

So pleased are we with the low cost of the set-up—which we feel has paid for itself in less than the year it has been in operation—that we hope soon to be able to expand it. When the original installation was made, it was with the idea that we might wish to extend it, so it was designed as part of a long-time plan. Therefore, when we do make additions, it will not be necessary to break down the conveyor system that we are already using so successfully.

Employee Handbook Answers All Questions

Stetson booklet, written by foremen, outlines company policy, holds back no useful information. In two parts, one for all employees, other for foremen only

JOHN E. CHRIST, Industrial Relations Manager, John B. Stetson Company, Philadelphia

WHEN WE HAVE a problem we like to solve it in our own plant. Stetson, together with many other companies unionized for the first time, has been faced with numerous problems. How we solved them is a story that may be of interest to other executives who have to deal with personnel policies. The problems fall into two broad classes—management faced with difficult situations in dealing with employees, and employees who do not know their rights.

In our plant the job of providing answers was taken up in the foremen's conferences that, since 1937, have been held periodically with the production manager. As individual problems of dismissals, pay for overtime, hiring, and lay-offs were discussed, they resolved themselves into the question what the company's policy is. So it was decided to draw up a statement of policy covering the questions that most frequently confronted the foremen and the employees.

Born in Philadelphia in 1904, John E. Christ attended Abington High School; Lafayette for a year. Left school to go to work for John B. Stetson as a rack pusher. In three months was promoted to paymaster's department, where he worked for several years as payroll and cost clerk. Switched to time study when standards system was installed. Later took charge of the payroll and cost division. Became industrial relations manager in late 1937. Spends lots of his spare time woodworking

How could this information be made readily available for all? Many years before Stetson had published a booklet of information about the company and its employees. This book had been given to everyone working in the plant. It had contained discussions on such topics as hours for business, starting and closing time, timeclocks, payment of wages, absence from work, welfare work, medical and dental service, Stetson Hospital, savings fund, beneficial association, group insurance, suggestion boxes, safety committee, adjustment of grievances, and fire instructions. The booklet gave no information about how an employee was hired or how he was dismissed.

According to present-day standards of labor relations, the booklet would sound like paternalism. However, 30 or 40 years ago Stetson was considered as doing an outstanding job in concerning itself with the welfare of its employees. Many welfare innovations were started at Stetson and widely copied by other firms.

At the beginning of the present foremen's conference plan, it was decided to bring out two new books—one for the foremen and the other for the remainder of the employees. "What shall we put in the books and how shall we go about making them up?" were among the questions raised. The group decided that the people in the plant should put their own ideas into practice. The foremen appointed four of their members to meet with Dale Purves, treasurer and production manager, and me, to decide what we all considered the most important points to be included.

After the foremen had worked up the material in their own language, a first draft was submitted to another committee of eight foremen for criticism and changes. The revised manuscript was then run off on a duplicating machine and presented to the whole foremen's conference for further recommendations. The conference was particularly instructed to make sure that the statements in the manuscript did not conflict with the company's policy, and that they expressed what they meant—no more and no less. The final manuscript was then sent to Stetson's former president, and the local officials of the union. The union made four suggestions, two of which were adopted and the other two rejected. One of the adopted suggestions was that any employee coming to work without a hat should be subject to dismissal.

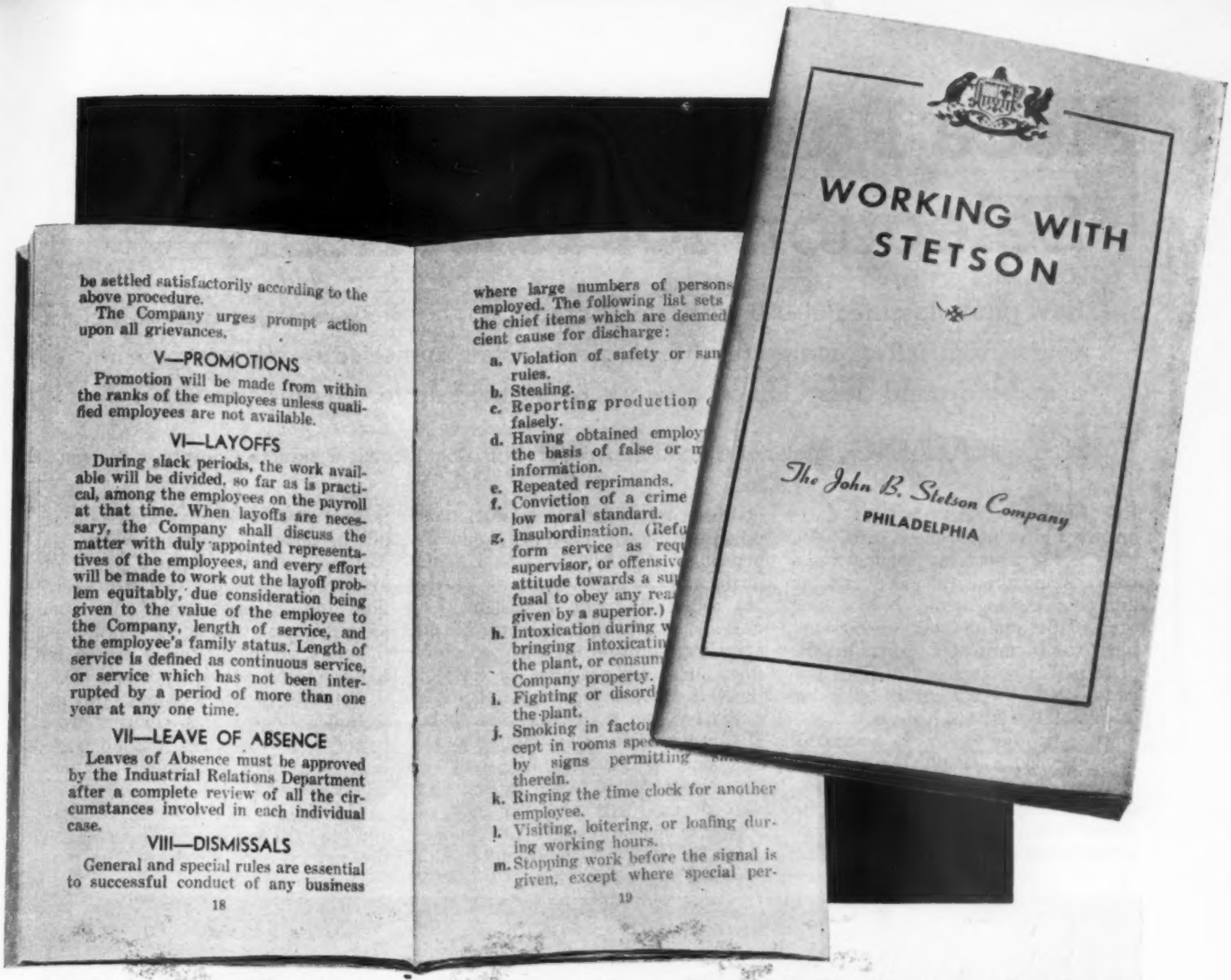
Two Books Printed

Next the manuscript was turned over to the company's lawyers, to see if it conflicted with the law. It was then printed in two books—one with a blue cover, for the foreman, which contained the entire manuscript, the other with a yellow cover, which omitted the first eleven pages of the foremen's copies. These books now became the company's manual of labor policy. The first, 1938, edition was revised in 1939 to make it more personal. Its title, for example, was changed from "Manual of Information for Employees of John B. Stetson Company" to the less formal "Working With Stetson."

In the foreman's manual a foreword explains that that book is in two parts, and that the first part gives information specifically to foremen.

The first part deals with the following topics:

New Help. When new help is


be settled satisfactorily according to the above procedure.
The Company urges prompt action upon all grievances.
V—PROMOTIONS
Promotion will be made from within the ranks of the employees unless qualified employees are not available.
VI—LAYOFFS
During slack periods, the work available will be divided, so far as is practical, among the employees on the payroll at that time. When layoffs are necessary, the Company shall discuss the matter with duly appointed representatives of the employees, and every effort will be made to work out the layoff problem equitably, due consideration being given to the value of the employee to the Company, length of service, and the employee's family status. Length of service is defined as continuous service, or service which has not been interrupted by a period of more than one year at any one time.
VII—LEAVE OF ABSENCE
Leaves of Absence must be approved by the Industrial Relations Department after a complete review of all the circumstances involved in each individual case.
VIII—DISMISSALS
General and special rules are essential to successful conduct of any business
18
where large numbers of persons
employed. The following list sets
the chief items which are deemed
cient cause for discharge:
a. Violation of safety or san
rules.
b. Stealing.
c. Reporting production
falsely.
d. Having obtained employ
the basis of false or
information.
e. Repeated reprimands.
f. Conviction of a crime
low moral standard.
g. Insubordination. (Refu
form service as requ
supervisor, or offensive
attitude towards a su
fusal to obey any rea
given by a superior.)
h. Intoxication during w
bringing intoxicatin
the plant, or consum
Company property.
i. Fighting or disord
the plant.
j. Smoking in facto
cept in rooms spe
by signs permitting
therein.
k. Ringing the time clock for another employee.
l. Visiting, loitering, or loafing during working hours.
m. Stopping work before the signal is given, except where special per-
19
WORKING WITH STETSON
The John B. Stetson Company
PHILADELPHIA

Booklet is the outcome of a sincere attempt to put down in black and white the company's policy on hiring, firing, promoting, and so on. Putting all cards on the table helps promote healthy labor relations

needed a requisition signed by an officer of the company must be sent to the industrial relations department. Qualified applicants are then sent the foreman by that department. Available employees are given first consideration. No applicants are to be interviewed by the foreman unless this procedure is followed. Foremen are cautioned against hiring close friends or relatives.

Within a few weeks after the new employee is hired the industrial relations department will send a follow-up card to check on the suitability of the new employee.

Promotions and Transfers. It is the policy to promote or transfer employees having suitable qualifications from within the company to fill a position before hiring an outsider.

Terminations. It is the policy of the company that all contemplated lay-offs must be taken up with the industrial relations department. Before dismissing an employee, a written record of reprimands must be submitted to the department, which gives the employee a fair hearing. If he is dismissed, he will be told by his foreman the true reasons for his dismissal.

Employee's Absence from Work. After three days' absence the social worker is notified. She visits the employee and reports to the foreman.

Handling of Grievances.

1. Every effort should be made to settle the dispute or question by the foreman, conferring with the local shop committee.

2. If the two parties are unable to settle the point, the shop committee may call for the shop steward.

3. If the shop committee calls the shop steward, this procedure must be arranged through the industrial relations department.

4. The industrial relations department will make arrangements for a meeting in which management will be represented.

5. Immediate arrangements for the meeting are stressed, as well as the choice of representatives who are properly qualified to judge the dispute.

6. Aside from any grievance, the foreman or the shop steward might want to confer about certain matters. Arrangements for such meetings should be made through the industrial relations department. Minutes should be kept of all important meetings and copies given to the local union.

Unemployment Compensation. The foremen are instructed to schedule working time of employees in slack seasons so that unemployment compensation can be collected.

Women's Labor Law. Foremen are warned to schedule hours of women employees to conform with state law.

Foremanship Pointers. Detailed advice is given in the book on the following points: (1) Discipline, (2) fairness, (3) grievances, (4) promotion, (5) pay, (6) safety, (7) neatness, (8) personal relations, (9) en-

(Continued on page 166)

Piece Parts Control Speeds Selection for Assembly

New plan classified 30,000 piece parts by materials. Stock selector for each class works from bill of material with his parts listed numerically. Faster picking, no chasing around, less chance of work being held up for missing parts

H. F. MARLING, Material Control Supervisor, Bull Dog Electric Products Company, Detroit

ELECTRICAL SWITCHES and bus ducts involve a great many piece parts. We have 3,000 apparatus catalog numbers. Many thousand piece parts go into these catalog items. Not so long ago, 75 percent of sales were assembled from completed parts in the piece parts stockroom. But since January, 1940, 75 percent of sales are carried in our finished-stock warehouse. In other words, 75 percent of inventory is in salable merchandise.

The first step in this change-over was to reorganize the stockroom for proper selection of parts to fill assembly orders. Delays in filling orders had been traceable to poor stockroom procedure. Even now, with only 25 percent of sales carried as piece parts in the stockroom, selection for assembly orders is vitally important, because increased sales have placed an even larger load on the stock selectors than under the old plan, in spite of the shift in manufacturing policy.

Parts in the stockroom used to be arranged according to catalog numbers, on the theory that the stock selector could go to a bin section and find all the parts for each item of apparatus in one place. Interchangeable parts offered a complication, and the absence of any notation on the bill of material regarding where the parts were located required plenty of memory work—and excessive selection time. Interchangeable parts were located in one part of the stockroom, therefore, if the part was not to be found in the proper apparatus rack, the selector had to look for it in this section. Engineering changes were frequent, so that there was no possibility of keeping the parts in numerical sequence.

This plan was too costly in time, and required too much experience on the part of stock selectors. The next

Small and inexpensive parts, such as screws, are requisitioned in bulk, and one or two weeks' supply is placed in steel stock bins at the ends of assembly benches. Saves time for stock selectors

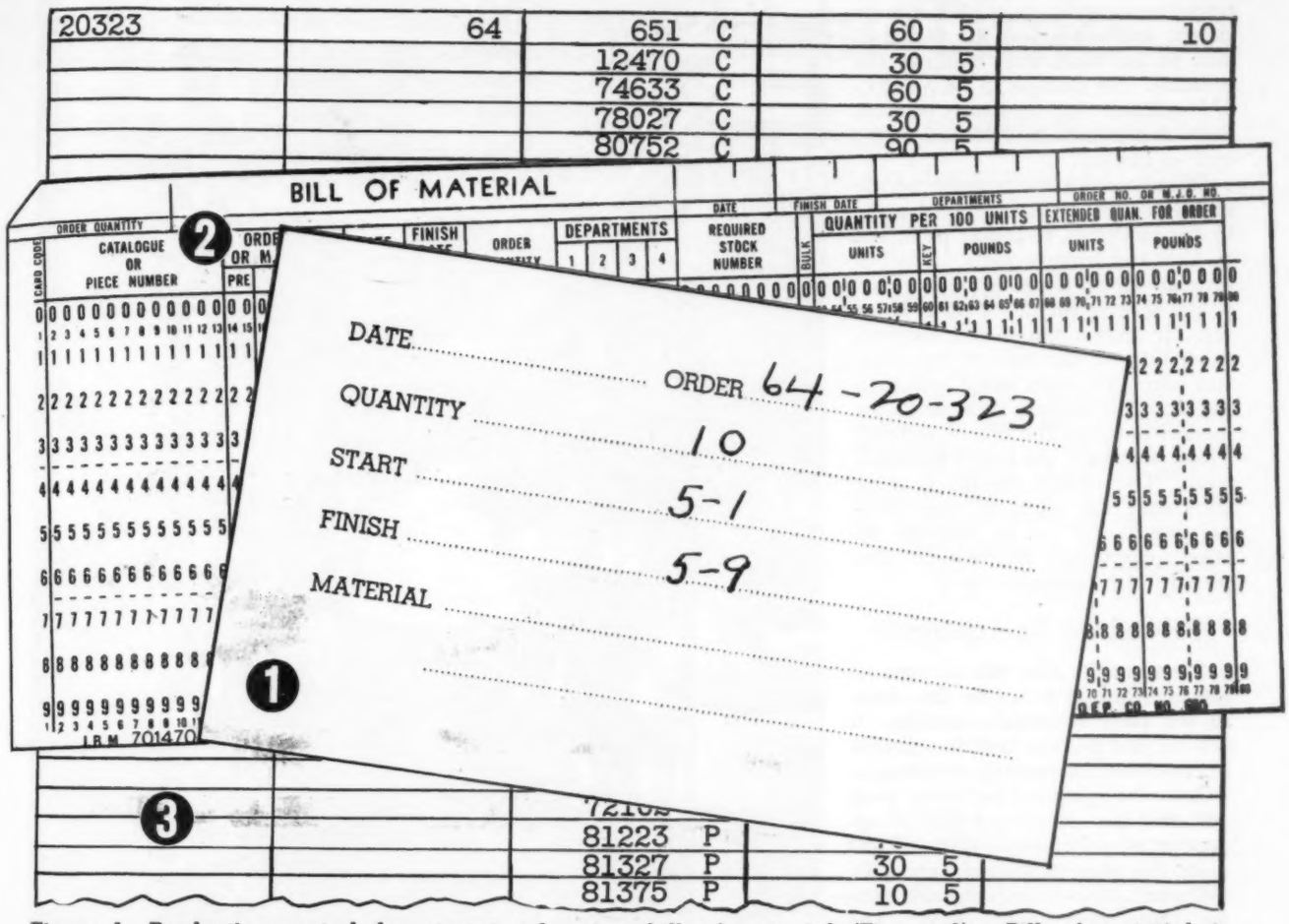


Figure 1. Production control department order—in this instance 10 No. 64 switches. Figure 2. Master tabulating cards are removed from the file, reproduced, extended automatically, used to print the bill of material (Figure 3). Bill of material is arranged first according to class (materials from which made) and then numerically within each class. This list is used by stock selectors

development was to do away with catalog numbers on stockbins, arrange the parts in numerical order, and indicate this sequence on the bin sections next to the main stockroom aisle. One section, for example, would carry all parts from No. 500 to No. 2,500. At the same time, the bill of material was rearranged to list the parts in numerical order. This helped some, but we still had trouble with inexperienced selectors. Part No. 1 on a certain piece of apparatus might be in rack 1, and part No. 2 in rack 5. With sales on the increase, we could add selectors up to the point where they got in the way of one another, but delays in getting parts to the assembly floor still existed—the problem of quick and accurate stock selection was still unsolved.

Also, under this method of operation, the morale of the stockroom people was far from good. They were being blamed for slow deliveries to the manufacturing floor, when the real difficulty was the poor and awkward plan of organization under which they had to work.

The final change, the one now in operation, was developed to take full advantage of a tabulating card system that had been introduced a short time before.

To begin with, the sequence of parts entered on the bill of material corresponds to the physical location of the parts in the stockroom. A classification was developed that grouped parts into classes according to the material from which they are manufactured:

A—Inclosure parts—steel
C—Copper
E—Special parts
F—Fiber
I—Inactive parts
N—Name plates
P—Standard purchased parts
S—Steel

Parts in the stockroom are ar-

Storekeeper for U. S. Steel, cost clerk for Pennsylvania Railroad, office manager for a department store, all years of experience that, plus correspondence school courses sandwiched in between his work, gave H. F. Marling the knowledge he needed to reorganize Bull Dog's stockroom control system. He's been with his present company since 1928

ranged numerically under each of these classes, and a sign on the rack-ends next to the main aisle indicates the contents. For example, *S 78,900–81,-373* indicates that steel parts between these numbers are to be found in the rack so marked.

Stock selectors are assigned permanently to steel parts, to special parts, to standard parts, to copper parts, and to fiber and inactive parts. A bill of material for an assembly order comes to the selector for the *A* parts, let us say. He takes a pan or skid platform, depending on the size of the order, and selects the parts noted, which he can do easily because they are in numerical order on the bill of material. These parts go to the end of the stockroom. The selector for the *B* group then adds the indicated parts from his group, and so on through the other groups until the order is completed for the assembly floor.

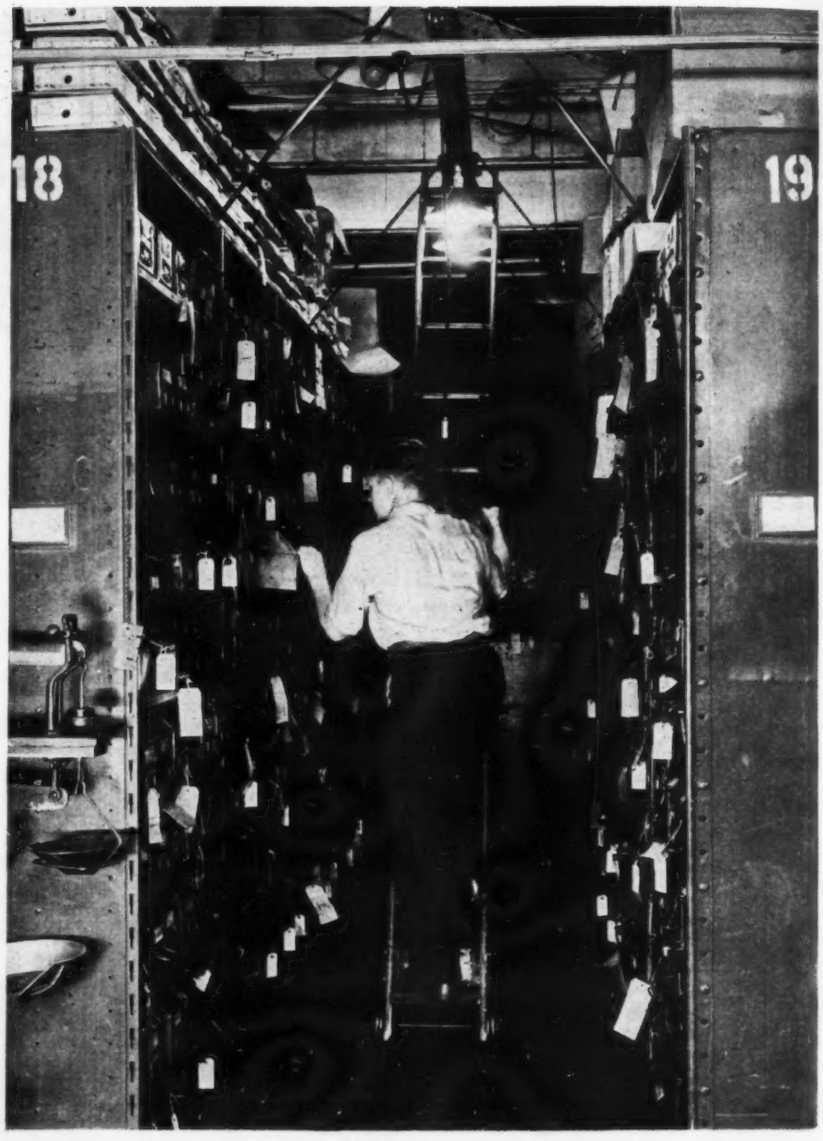
Procedure Reorganized

Procedure for the bills of material was reorganized to make this order in the parts stockroom possible. It was for this purpose that the tabulating machine equipment was utilized.

A card is prepared for every piece part that goes into every item of apparatus manufactured. With 40,000 parts, this means a total of some 120,-000 cards, when interchangeable parts are taken into consideration. The cards are filed according to catalog numbers in the tabulating files.

Let us assume the production control department orders the fabrication of parts for ten No. 64 switches (Figure 1). This order goes to the tabulating department for preparation of the bill of material. Master tabulating cards (Figure 2) for this catalog number are removed from the file, reproduced, extended automatically, and then used to print the bill of material (Figure 3). Master cards are then refiled. This list, it will be noted, is arranged first according to class (material from which made), and then numerically within each class. This is the list that is used by the stock selectors in putting up the order.

The master cards in the tabulating files are marked to indicate the quantity of each part required per 100 pieces of apparatus to which the part applies. Therefore, the number of parts to be noted on the bill of material for the assembly order must be adjusted accordingly; if an order calls for 1,000 pieces, and if one of part No. 1 is required on each item of apparatus, the quantity shown in hundreds on the file card would be multiplied by ten before punching the bill-of-material card and running off the list shown in Figure 3. This extension, however, is made automatically as the cards are duplicated from master file cards.



Lights on movable brackets dropped from the ducts that are between each two rows of stock racks give stock selectors efficient light where it will do most good, speed up stock selection

We mentioned engineering changes as one complicating factor in the old plan. They still exist, and disrupting the numercial sequence of the parts in any class would result in the confusion prevalent in the old plan. We have a standard bill of material form (not shown) on which part numbers for each piece of apparatus are noted. When a change is made on this form, the necessary card change is made in the tabulating files to preserve the proper numercial sequence.

Perhaps it should be mentioned that small and inexpensive purchased parts, such as screws, are requisitioned in bulk, and one to two weeks' supply is placed in bins at the ends of assembly benches. This materially reduces the work of selection in the parts stockroom.

Frequently what we call a "program" is issued for fabrication and assembly. This may consist, for instance, of 30-amp. switches of a certain size range, consisting of several catalog numbers. The bill of material for this program will be run off as a composite of all parts required. This bill must be checked to determine which parts are available and which must be fabricated. Available parts are selected in the manner indicated. Fabricated parts for these programs

(*Continued on page 168*)

Right Rates the First Time

Michigan plant check and double checks. Compares snap-back studies with continuous watch readings. Then films the operation. Here a discussion of problems involved in setting standards that guarantee worker satisfaction

W. J. PEARSE and W. H. PRIESKORN, Time-Study Department, King-Seeley Corp. Ann Arbor, Mich.

WE SHALL TAKE IT for granted in this article that the uses of time study are too well known to need repetition. Problems of acceptance may be sidestepped with the statement that workers are satisfied if rates are set fairly and honestly by the time-study observer. It is our purpose to indicate how our experience has solved some of the problems of measuring productive work in our own practice. Let's clear out of the picture at once any implication that our solutions are the ultimate. Our practices are changed —improved, we believe—as time goes on and as we appreciate more fully the intricate nature of the time-study job.

Before digging into problems of standard application, it will be well to indicate the general nature of our work, because that will affect some of the practices to be discussed later. Many jobs involved in the manufacture of gas gages, speedometers, heat measuring gages of various kinds, and governors run constantly, day in and day out. But from 15 to 20 percent of total output consists of small job lots, repeated at irregular intervals as ordered by the scheduling department.

These non-continuous jobs frequently mean that an operator in the machine shop works on seven or eight different jobs during the day; in assembly departments the average is about three different jobs during one day. New work and engineering changes made by ourselves and by our customers add to the complication. To provide for these variations, a practice has been developed, which is outlined and described here briefly.

The number of observations made on each job varies with the regularity or smoothness with which the job is done. For this reason the number varies on both sides of twenty—the less regular and systematic the job, the more observations are taken.

For instance, on simple press operations where the method is smooth and regular, about 15 minutes are required to gather the data, and 20 minutes to work up the rate. On the other hand, in a job that involved stripping an inch of insulation from four prongs of a connecting wire, an hour was required to gather the data, because some wires were imperfectly stripped by the stripping device, and the operator had to complete the job by hand. This irregularity made an extended study necessary to get an adequate

A copy of the operation description card (see Figure 4) is placed at the job. If, as engineering changes are made, additional work is necessary, the worker is quick to call it to the attention of the supervisor

KING-SEELEY CORPORATION

TIME STUDY OBSERVATION SHEET

OPERATION NO. 32025 | SHEET NO. 1 OF 1 | LOOP NO. 3940 | DEP'T NO. 32 | UNIT MEASURED

B. H. EST. 80 | B. H. ACT. 78 | O. A. TIME 4.5 | QUAN. 50 | DATE 4-24-41 | TIMER W.H.P. | MACH. NO. Midget Hand | OPERATOR F. Seeger | STOCK SPEC. | FIXTURE NO. None

OPERATION: Assem. Anchor Plate to Staff

DESCRIPTION OF PRODUCT: Balance Wheel Assembly #8211

DATA: Tray at left for anchor plates. Trays at right for unfin. & fin. pcs. Spring to return handle to idle.

Lh. to pick up anchor plate slide into nest. Rh. pick up balance wheel, orient wbh. & assemble to ram (two pins). Rh. work press handle, pull fin. pc. from ram & toss into tray at right

A_o					
100 65	8.0 75	6.0 80	9.0 70	6.0 80	
7.0 75	14.0 50	7.0 75	7.0 75	7.0 75	
10.0 65	8.0 75	7.0 75	8.0 75	9.0 70	
7.0 75	7.0 75	8.0 75	8.0 75	8.0 75	
8.0 70	10.0 65	7.0 75	9.0 70	8.0 75	
9.0 70	10.0 65	8.0 75	8.0 75	10.0 70	
7.0 75	9.0 75	8.0 75	7.0 80	7.0 75	
9.0 70	7.0 75	8.0 75	8.0 75	10.0 65	
9.0 70	8.0 75	9.0 70	8.0 75	8.0 75	
8.0 75	7.0 75	8.0 75	13.0 60	7.0 75	

MENTALITY	SKILL	RESPONSIBILITY	MENTAL APPLIC.	WORK COND. GEN	WORK COND. EXP.	TOTAL
10	40	10	5	15		
0	0	0	0	1/2	0	1/2

	A_o	
80	6.0	II
80 75	7.0	IIII IIII III 1
70 75	8.0	IIII IIII IIII II 1
70	9.0	IIII III
70 65	10.0	IIII
	11.0	
	12.0	
60	13.0	1
50	14.0	1

Assem. anchor plate to staff A_o .1000 @ 60 × 115 = .1150 × 1/1 = .1150

Miscellaneous = .0020

.1170

117 B's / 100 pcs.

513 pcs. / 60 B-Hr.

Figure 1. Snap-back study of the assembly of an anchor plate. Total selected time was 0.08 minute. Therefore only one element was used

measure of the amount of hand stripping necessary.

The snap-back method of watch study is preferred. However, we are at present taking a continuous study as well—both on the same job. The latter is well adapted to catching small elements, because the tendency is to divide the job into smaller divisions in this method. If a change is made later in the standard time of the job, the changed elements can be adjusted without materially affecting the remainder of the original study.

Where elements occur at irregular intervals, such as getting stock, the continuous method needlessly complicates the time calculation. One method is used as a check against the other. However, we may find that the continuous method does not offer enough advantages to warrant its use. At present, taking times by both methods seems advisable as a check, because our rates are guaranteed—they must be right the first time. In addition, careful checking is advisable because variations between jobs—loose and tight rates—are especially to be avoided, if worker acceptance is to be maintained.

Figure 1 shows the snap-back study of the assembly of an anchor plate to staff. The total selected time for the job was 0.08 minute. Therefore only one element was used. Figures 2 and 3 show the front and back of the same study, by the continuous method. Here two elements are used. Should a variation of sizable proportions occur in the snap-back method, the reasons are evident in the continuous study—a tool change, for example, might be required to bring the element that proves to be at fault to a consistent value.

Rate Is Issued

The time-study observer works up the data indicated on Figures 1, 2, and 3, and when approved by the head of the department, the rate is issued as 0.1175 minute per piece, on 11.7 standard minutes per 100 pieces. When the rate is worked up, an operation description card (Figure 4) is made out for the operator, and placed in a holder at the bench or machine. It will be noted that this card identifies the job and indicates the method to be used by each hand in the operation. If a change occurs later in the method of operation, the worker can easily identify the change, and the time-study observer can do likewise, and make necessary adjustments.

This really completes the procedure for setting the standard for the operator, but we do not feel justified in regarding the case closed, for rates must be accurate and consistent with the effort required on other jobs.

As soon as a watch study is completed, the observer immediately takes an 8-mm. motor-driven camera, run at 1,000 frames per minute, and photographs eight to ten cycles of the job. Since there are only a few minutes between the watch study and the camera study, we can be sure that the

Figure 2. Front of the continuous-method study sheet used to set standards on the operation that is shown in Figure 1. Here two elements are used. Note that the lower sets of figures should be subtracted

ELEMENTS	SPEED	FEED	RED NUMBERS SUBTRACTED TIME 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	SPEED RATING	AVERAGE TIME	SELECTED TIME	EFFORT
Rh. pull fin. pc. from fixture			4	14	23	33	41	52	61	70	80	89	99	10	20	30	40	52	63	73	83	92				
Lh. pick up and place anchor plate in fixture		*	4	5	4	5	4	5	5	5	5	4	4	4	4	4	4	5	5	4	5	4	56-60		5.0	
Rh. pick up wheel asmby. orient wbh. & place on ram (pallet down)			9	19	28	37	47	56	65	75	85	95	06	16	26	36	47	58	69	78	88	98				
Rh. work press lever & release		*	5	5	5	4	6	4	4	5	5.	6	7	6	6	6	7	6	6	5	5	6	60-65		5.0	

TOOLS, JIGS, GAGES, ETC. Midget hand press. Spring to return handle to idle

Tray at left for anchor plates. Trays at right for fin. & unfin. pcs.

OVER-ALL SPEED	START	END	TOTAL TIME	ACTUAL PER PCE.	FIN. UNITS
60			1.98	.099	20

* These two rows are red figures on original form.—Editor

OPERATION NO. 32025

OPERATION: Assm. Anchor Plate To Staff
PART NAME: Balance Wheel Asmby PART NO. 8211
MACHINE: Midget Hand Press MACHINE NO. —
OPERATOR: F. Seeger
EXPERIENCE: 1 Month DEPT. NO. 32
MATERIAL
OBSERVER: W.H.P STUDY DATE: 4-24-41 DIE NO. —
REMARKS — SKETCHES

SUMMARY

ELEMENT	SEL. TIME	SPEED	EFFORT FACTOR	B'S	OCCUR	ALLOWED TIME
Place aside fin. get anchor + place	.0500	60	113	.0565	1/1	.0565
Place wheel asmby. work press handle	.0500	60	115	.0575	1/1	.0575
						—

SUB TOTAL .1140
MISC. .0030
TOTAL .1170

11.7 B's /100 pcs, 513 pcs /60 B-Hr.

MENT-ALITY	SKILL	RESPON-SIBILITY	MENTAL APPLIC.	WORK COND. GEN.	WORK COND. EXP.	TOTAL
10	40	10	5	15		
0	0	0	0	½	0	½

PART 82-11 OPER. 32025

Figure 3. Back of the continuous-method study sheet. Should a sizable variation occur between the snap-back and continuous methods, the reason immediately becomes evident in the continuous study

method is the same in both instances. The reasons for the picture taking will be developed in detail later; it is sufficient now to indicate the agreement between the watch study and the camera study. Incidentally, this is a third check on each standard set; the first two were the continuous and snap-back watch readings.

As soon as the film is available, it is analyzed frame by frame in the darkroom. The results of this analysis are given in Figures 5, 6, 7, 8, and 9. Each hand is analyzed separately, Figures 5 and 6, and the two hands are combined in Figure 7. The hands are checked separately because it is easier, and any necessary change to eliminate idle time is apparent. It will be noted in the given analysis that six divisions, or elements, are noted for each hand, whereas the continuous watch study listed only two divisions for the complete job, and the snap-back study only one—an indication of the minuteness of analysis possible with the camera.

Final Summary

Final summary of the camera study is made in Figure 9. Note that in this instance a standard time for the job of assembling anchor plate to staff is 0.118 per piece or 11.8 standard minutes per 100 pieces. The results with the watch study showed 11.7 minutes. The difference is explained by the greater precision of the camera study. If there is an appreciable difference between the watch study and the camera study—the latter higher, or taking more time—a rate change is made, and the operator is given the advantage of the longer time. It must be understood that the time indicated by the watch study is already on the job, and the camera study is completed a few days later. A camera analysis time of 5 percent or more above the watch study forms the basis for a standard time increase.

It should not be assumed that inaccuracies in watch studies cause many such adjustments to be made. As a matter of fact, changes are made rarely. We feel that greater accuracy is assured on the part of the watch-study observer, because a day of reckoning arrives for every job when the camera analysis is made. This duplication is costly, yes, but accuracy is always costly, and any attempt to save is apt to result in inequitable rates and worker dissatisfaction.

Films are used for other purposes in addition to checking watch studies—purposes, as later discussion will show, that amply warrant the cost even if the films were never used to check watch studies.

Purpose of this article, however, is to discuss problems arising in standards application. We thought it necessary to outline our methods, to serve as background for this discussion. In the various examples mentioned above, a rating of observed times is indicated. In Figure 1, for example, the watch reading selected was 0.08 minute; this was adjusted by rating the operator's speed at 75. The cycle time of 0.1

Figure 4. Operation description card. One copy is made out for the operator, the other is filed with the time-study data

OPERATION DESCRIPTION CARD

OPERATION NO. 32025 PART NO. 8211 PART NAME Balance Wheel Asmby.
OPERATION NAME Assem. Anchor Plate to Staff DIE LOCATION
TOOLS USED Midget Hand Press. Tray at left for anchor plates Trays at right for fin. & unfin. pcs. Spring to return handle to idle.
FIXTURE OR DIE NO. None MATERIAL
METHOD Lh. pick up anchor plate, slide into nest. Rh. pick up balance wheel asmby. orient whh. & assemble to ram (two pins) Rh. work press handle: pull fin. pc. from ram. drop into tray at right

B-VALUE 11.8 QUANTITY FOR 60 B-HR. 509 BASE RATE DATE 4-29-41

ANALYSIS DATA SHEET

PICTURE DATE 4-24-41 LAST TITLE FRAME NO. _____ DATE 4/29/41
CARD NO. 3940 PRESS SIZE _____ FIXTURE NO. _____
OPERATION NO. 32025 DIE NO. _____ OPERATOR F. Seeger
DESCRIPTION Assemble Anchor Plate to Staff

ELEMENT Right HAND	309 FRAME COUNT 1	2	3	4	5	6	7	8	USE
Assemble Anchor Plate	338	429	522	624	715	808			25.0
1 to Ram	29	26	26	(39)	23	22			
T.E. to press handle &	355	446	543	639	733	824			17.5
2 pull down	17	17	21	15	18	16			
T.E. to fin. pc. and	368	459	555	653	750	837			13.0
3 remove from fixture	13	13	12	14	(17)	13			
T.L. with fin. pc. and	374	466	563	658	761	844			6.5
4 drop into box	6	7	8	5	(11)	7			
T.E. to anchor plates	390	482	577	677	777	859			15.0
5 and p.v.	16	16	14	(19)	(16)	15			
T.L. with plate to Lh.	403	496	585	692	786	874			12.5
6	13	14	8	15	9	15			
									89.5
7									

Figure 5. Camera studies are taken only a few minutes after the watch study was made, so that there is no chance for a change in method. Here are the results of the analysis of the right hand

Figure 6. Results of analysis of the left hand. Film is analyzed frame by frame in the darkroom. Incidentally, the camera study is a third check on each standard set—although it has additional uses

ANALYSIS DATA SHEET

PICTURE DATE 4-24-41 LAST TITLE FRAME NO. _____ DATE 4-29-41
CARD NO. 3940 PRESS SIZE _____ FIXTURE NO. _____
OPERATION NO. 32025 DIE NO. _____ OPERATOR F. Seeger
DESCRIPTION Assemble Anchor Plate to Staff

ELEMENT Left HAND	309 FRAME COUNT 1	2	3	4	5	6	7	8	USE
Assemble anchor plate to	338	429	522	624	715	808			25.0
1 ram	29	26	26	(39)	23	22			
T.E. to staffs in tray	349	438	532	632	725	817			9.5
2	11	9	10	8	10	9			
P.V. staff from tray	374	466	559	658	747	842			26.0
3	25	28	27	26	22	25			
T.L. with staff to fixture	383	478	569	667	758	854			10.0
4	9	12	10	9	(11)	12			
Locate staff under	394	489	577	683	775	867			11.0
5 ram	11	11	8	(16)	(17)	13			
T.E. to r.h.	403	496	585	692	786	874			8.0
6	9	7	8	9	(11)	7			
									89.5

per piece was secured by multiplying $0.08 \times \frac{75}{60}$ and this time with a fatigue factor of 15 percent, and a small adjustment, gave the standard time per piece of 0.117.

Rating the speed of the operator is a problem in standard-time application. We consider that 60 represents normal speed of an operator working on day rate, and grade above and below this rate in steps of 5 points as operator speed goes above or falls below this judgment of normal speed. Of course, there is nothing sacred about this particular scale; 100 might be considered normal, and divisions set above and below this standard, but once a scale is adopted it should be continued, because particular speeds become identified with particular graduations on the scale in the mind of the rater.

Two problems arise: Training the neophyte to rate; and keeping the concept of operator speed consistent in the minds of experienced observers. This is especially important if inconsistent rates are to be avoided as observers work in different departments. From our experience, at least, observer concept of speed will drift, unless careful measures are taken to prevent it.

To prevent this drift, films taken of each job at the same time the watch study is made, come into play. In busy periods, about four rating sessions are held each week, each lasting about an hour and a half. All time-study observers gather in the darkroom, and rate jobs upon which a standard has been set since the previous rating session. We repeat, the time-study observer rates the speed of the operator when the watch study was made; the rating session is a check on the watch study.

Training Device

But it is much more than this—it is a training device to keep speed ratings consistent. The observer in the pressroom rates the jobs studied by the observer in the assembly departments, and the other way round. One man's concept of speed is thus being checked against another man's concept of the same speed. Figure 8 is the summary of the speed ratings on the assembly of an anchor plate to staff, used as an illustration throughout this article. Five ratings by five different observers are listed—ratings of "F" and "K" are made by beginners, and are not included in the average figure, nor in the group rate set on the job. This, by the way, illustrates one way of training a time-

Time-study men have to be on their toes all the time. Several times each week they all meet in the darkroom to rate jobs on which standards have been set since the previous session. They check one another

study observer-to-be; in these rating sessions his judgment of speeds is constantly checked against that of experienced men.

Three different projector speeds are used for each job rated. The camera is run at 1,000 frames per minute when the picture is being taken. The projector may be set to run at any number of frames per minute, and the observer must be able to get the same final reading for speed. If, for example, the projector is run 1,325 frames per minute (Figure 8) on the first of three trials, and the observer judges the speed at 88, the operator is working at 66, $\left(\frac{1000}{1325} \times 88 = 66\right)$. It will be noted that observer "P" judged the speed of the operator on the three trials within a range of two points on the scale.

The group average of 67.5 is used to adjust the observed operator times to 60 or what is normal speed $(.0895 \times \frac{67.5}{60} = 0.1007)$. A fatigue allowance of 15 percent added to the adjusted time of 0.1007 gives the standard time of 0.1159 noted on Figure 9.

Despite the procedure just outlined, the concept of normal speed may drift unless measures are taken to prevent it. If this should happen and go unchecked, it would lead to inequitable rate setting. To prevent this drift we re-rate jobs upon which a rating was set two and three years ago. When these old films are run through the projector, the observers do not know the previous ratings.

Incidentally, using old films this way makes them fully worth the cost of taking them, even if it were the only use made of them. Aside from this, however, the old films are available when methods change. If an operator is not satisfied when a change is made, he is taken to the projection room, and shown the films—the old way and the new way. The films are a safeguard, too, against changing the time of elements in the job that are not affected by the change in method. The cost of the films varies with the length of the job cycle; perhaps we could say 50 cents is a fair average.

Perhaps an additional use of the films—and the rating sessions—should be mentioned. Before the rating of each job is begun in the darkroom, the film is run through the projector and studied for improvements in motions and in methods. Each job, therefore, has the benefit of the combined experience of the time study department, and each observer is, at the same time, upgraded by the comments of his co-workers. If an important improvement is found, a job change will be made. But such studies conducted over a period of time will lead all observers to realize poor motion patterns in the shop, and to insist that they be corrected before a watch study is made and a film taken.

There is difference of opinion

Figure 7. Both hands analyzed simultaneously. Hands are first checked separately. It is easier, and changes can be made quicker

EX. 2301-200-3-41

OPERATION ANALYSIS AND SYNTHESIS SHEET

CARD NO. 3940 DESCRIPTION Assemble Anchor Plate to Staff

OPER. NO. 32025

STUDY NO.

SEQUENCE ORIGINAL | SPEED RATING | SHEET NO. 1 OF 1 | DATE 4-29-41

EFFORT | TOTAL MIN. .0920 | B-VALUE | PER

FOOT	LEFT HAND	FRAME		RIGHT HAND
	Assemble wheel to ram	25.0	25.0	Assemble wheel to ram
	T.E. to anchors in tray	9.5	17.5	T.E. to press handle and pull down
	P.V. anchor from tray	26.0	13.0	T.E. to fin. pc. & remove from fixture
			6.5	T.L. with fin. pc. & drop into box
	T.L. with anchor to fixture	10.0	15.0	T.E. to tray of wheel & p.v.
	Locate anchor in fixture	11.0	12.5	T.E. with wheel to l.h.
	T.E. to r.h.	8.0		
		89.5	89.5	

among time study users about the possibility of separating considerations of skill from those of speed in speed rating a job. We have not found it feasible to make an ironclad distinction between them, because skill, especially on new jobs, does creep into the ratings. The ratings may therefore be thought of as ratings in effectiveness instead of exclusively in speed of movement.

Of course, we do not rate a job until the method is satisfactory to the time-study observer and to the foreman. On a midget hand press, for example, the operator was exerting too much effort on the 6-in. handle used in the assembly of pallet to staff. The foreman planned to have a longer handle with a greater leverage installed —the time study was postponed until the change was made. Sticky parts and poor operator technique are further reasons for the postponement of a study until these things and any other errors are corrected.

No Pressure

Although management exerts no pressure on the time-study department to get jobs on incentive, the workers want the opportunity to earn a bonus as soon as possible. We find in our rating sessions, therefore, that work accomplished according to the speed of the observed operator plays a part. This is an additional reason for rating sessions—to keep adjustments that are made for effectiveness consistent throughout the department. Our rates are guaranteed and they must work to the satisfaction of both parties—workers and management. It would be unfair and lead to inequitable rates if two operators working side by side, but on different jobs, were rated at the same speed, when one was more effective than the other. The less effective operator has the chance to improve and earn a larger bonus; the more effective worker has no such opportunity—hence in our practice consideration of skill does form a part of the rating technique.

Other characteristics of work may require that attention be paid to skill. For example, the observer in the assembly department, who is responsible for the rates on that class of work, points out the skill involved when one of his jobs is under observation in the rating sessions. A difficult positioning, or the necessity of handling delicate parts carefully, may force a reduction in the speed of the transport movements. At the same time, the observer responsible for rates in the press department—who also has operations involving difficult positioning—is in a position to check the evaluations of the assembly observer.

GROUP SPEED RATING

NAME	PROJ. 1325	ACTUAL 1000	PROJ. 900	ACTUAL 1000	PROJ. 1100	ACTUAL 1000	PROJ.	ACTUAL	AVG.	VARIANCE
P.	88	66	58	64	70	64			64.7	−2.8
B.	96	68	65	72	75	68			69.3	+1.8
* F.	~~100~~	~~76~~	~~73~~	~~81~~	~~85~~	~~77~~			~~78.0~~	
* K.	~~95~~	~~72~~	~~70~~	~~78~~	~~83~~	~~75~~			~~75.0~~	
P.	85	64	65	72	75	68			68.0	+.5
*F & K are	beginners									
AVERAGE		66.0		69.3		66.7			67.3	−.5
GROUP RATE		67.5		67.5		67.5			67.5	

Figure 8. One man's concept of speed is checked against another's idea of same speed. Beginners' ratings not included in average

KING-SEELEY CORPORATION
TIME STUDY SHEET

DATA	MACH. NO.	OPERATION	MALE OR FEMALE BASE	OPERATION NO.
4-29-41	Midget hand	Assemble Anchor Plate to Staff	Female	32025
TIMER	**DIE NO.**	**DESCRIPTION OF PRODUCT**	**PICTURE DATE**	**CARD NO.**
J.I.A.		Balance Wheel #8211	4-24-41	3940
			OPERATOR'S NAME	**DEP'T NO.**
			F. Seeger	32

DATA ON SET-UP, DISTANCE, SIZE, WEIGHT, ETC.: Tray at left for anchors
Trays at right for fin. and unfin. pcs. Spring on press handle

SYM.	ELEMENTS OF OPERATION	SELECTED TIME-MIN.	SPEED	EFFORT FACTOR	B'S	OCCUR	B-VALUE
A.	Assemble anchor plate to staff	.0895	65-70	115	.1159	1/1	.1159
		Miscellaneous					.0021
							.1180
	11.8 B's / 100 pcs.						
	509 pcs. @ 60 B. Hr.						
	is 11.7 (original / temporary)						

Figure 9. Final summary of the camera study. The watch study shows 11.7 minutes per hundred pieces; the more precise camera, 11.8

Another problem involved in setting equitable rates may not always be considered a function of time study—in our case it is. And, since adjustments in the base rate for the job are made at the time the observer makes his study and speed ratings in the shop, it can be discussed at this point.

Methods changes, new jobs, and engineering changes all may call for more or less mental effort, application, skill, and responsibilty on the part of the workers. Working conditions may be affected by these changes. To the established base rate for the job are added differentials that would warrant increasing the hourly rate above the base. For our job evaluations, we use a point plan with adjustments for the factors just mentioned. Each point is given a value of one cent, and hourly rate groups are in steps of three cents for productive workers. In Figure 1 the time-study observer thought the job warranted a ½ point increase over the base rate. Therefore, no change in the rate was made. Had

(*Continued on page 170*)

Carter Products, Incorporated

IV—Who's Afraid of a New Idea?

Here's what sometimes happens to ideas that originate in the shop. When they're ignored, someone loses interest in his job, maybe starts looking for another. Fourth in a series about the troubles of an imaginary company

JOHN H. HILL, Industrial Engineer, Bundy Tubing Company, Detroit

SAM HOLLAND, superintendent of Carter Products, Incorporated, was in his worst mood last Thursday.

As I watched the Old Man's son-in-law studying a report that was as red as his face, I knew the day was going to be a hectic one.

"Scrap! scrap! scrap!" he complained aloud. "Idle time! Machine breakdowns! Excess set-up time! Poor efficiencies!"

He seemed to control himself with an effort as he glanced up.

"What," he growled, "do you suppose those fellows out in the shop put in their time for? What's on your mind?"

"That new double-spindle machine for the automatics department," I answered. "It can be shipped to us three weeks after the order is received. With automatic feed, it'll cost $1,200, and should pay for itself inside of five months. Here are all the figures." I laid a report in front of him.

"I'm not okaying another piece of new equipment until I see some returns from the money we've already spent. I've signed for $20,000 worth of new stuff in the last couple of months. And costs stay high. We've put money into a foreman-training program that's costing money. Every day some of our men are over there in the school, sitting around talking theories of good management. Where are the results?

"Tell Al Peasely I don't want to see any more recommendations for new machines until we get some money out of the ones we've bought!"

I went back to the methods and time study department and told Al what Sam had said. As usual, my boss had foreseen what the reaction would be, and far be it from him to stir up any trouble merely for improvements.

"I told you what would happen," he said, complacently, "but you wouldn't listen to me. For a while at least we'll have to forget any new equipment."

"But," I protested, "the figures speak for themselves. That machine would pay for itself, probably within three months."

"He doesn't see it," observed Al, "and that's all that matters."

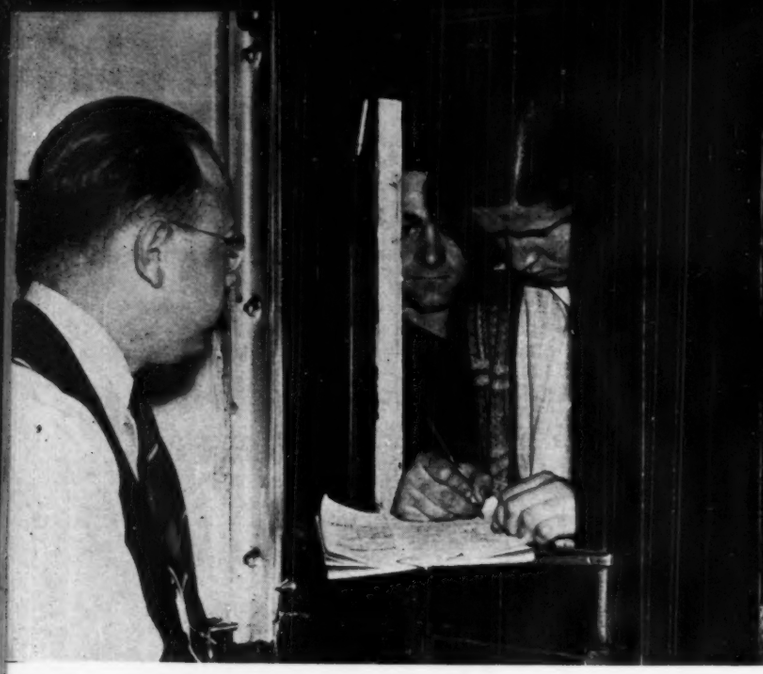
"But why?"

"Because," stated Al, "there are too many people around here making suggestions for improvements, who don't know enough about them. And there aren't enough foremen who give a hoot whether the ideas work or not."

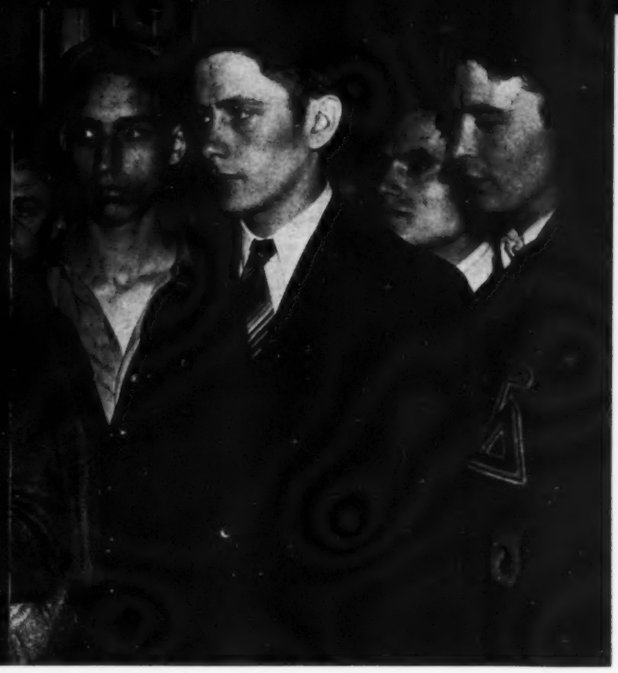
"Yeah," I agreed, ruefully. "Seems

(Continued on page 178)

Seems like a new idea is treated like a bomb. Everyone's afraid of it. Why are they all so scared?



Applicant for work at National Acme signs register, under the watchful eye of Robert Schaefer, assistant personnel director. Character, intelligence, and personality are first requisites. Experience in blueprint reading, mechanical drawing, shop practice helps.



This boy looks all right to Mr. Schaefer, so he is told to fill in an application, come back next day with his birth certificate or proof of his father's citizenship, for more interviews. Sometimes a boy who has the necessary papers starts work on the next shift

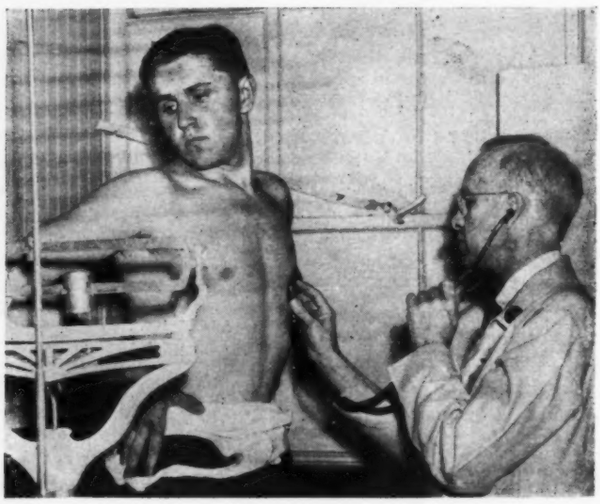
Youth Meets Machine

National Acme "learner" is taught all about one machine — to perform every operation, make his own set-ups, do his own inspecting

HAROLD A. ANDERSON, Director of Factory Personnel, National Acme Co., Cleveland

All information on the boy's application was checked before he got to see Harold A. Anderson, director of personnel. His record looks good. There is no evidence of activity in a subversive organization. His teachers and former employers speak highly of him. So far, so good. But he has two more steps before he's on the payroll

Here the boy goes through the next test—a thorough physical examination, given by Dr. C. D. Walz, company physician. Eyesight receives special notice, because work in the plant calls for reading fine figures. Allergy to oils and solvents is also checked. If the doctor okays the card the applicant has carried with him, back he goes to the personnel department for his final step before being hired



AFFIDAVIT OF LOYALTY TO THE UNITED STATES OF AMERICA AND HONEST WORKMANSHIP ON GOVERNMENT ORDERS

Name Clock No.

Address

Being an employee of The National Acme Company, subject to working on United States Government orders and being first duly sworn, deposes and says:

1. That I am a citzen of the United States ( ) Check
   That I am not a citzen but owe allegiance to ( ) one only
   the United States.

2. That I do not and will not advocate or hold membership in any organization that advocates the overthrow of the Government of the United States.

3. And further, that I am not a Communist, nor a member of any

WITNESS TO SIGNATURE:

(Signature of employee)

(Name)

Subscribed and sworn (or affirmed) to before me this

(Address) _____day of _____1940.

(Town)

(Signature) Notary Public

(Address of official administering oath)

Before he can be hired, the learner must take the oath of allegiance to the United States before a notary (above, left). Then he is sworn in by James E. Bidzovsky, paymaster. Next he signs the employment book, receives his badge and clock number, is told when, where, and to whom to report for work

Taken in tow by his new boss, Robert Rodehammel, the learner starts on his road to machine operator. Will be an observer for 2 to 6 weeks, learning to perform the simpler operations before this if he shows aptitude. Works an 8-hour shift and receives 50 cents an hour at start. Gets raises as fast as he earns them, until the standard rate for his particular machine is reached. Of the 1,200 learners hired since September, 1940, 98 percent are still on the job. Turnover for whole plant is under 10 percent

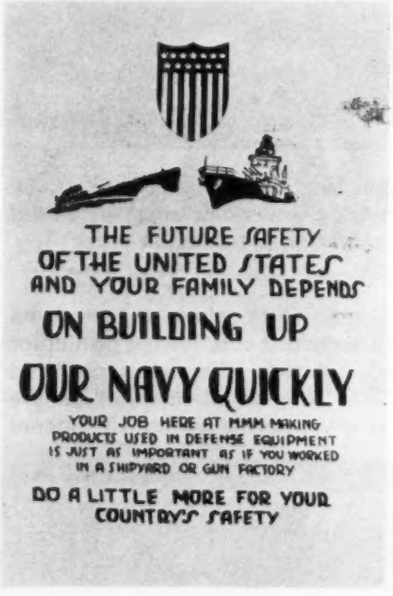
MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Employees Like Patriotic Posters

HAMILTON MERRILL, Vice-President, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

Series of six patriotic posters were made up by employees of our Bridgeport plant to inspire the 1,800-odd workers there to


THE FUTURE SAFETY
OF THE UNITED STATES
AND YOUR FAMILY DEPENDS
ON BUILDING UP
OUR NAVY QUICKLY
YOUR JOB HERE AT MMM MAKING
PRODUCTS USED IN DEFENSE EQUIPMENT
IS JUST AS IMPORTANT AS IF YOU WORKED
IN A SHIPYARD OR GUN FACTORY
DO A LITTLE MORE FOR YOUR
COUNTRY'S SAFETY

"do a little more for their country's safety." From the original tracing paper drawings black and white prints were made. Blue and red showcard ink was added to liven them up and emphasize their patriotic theme. So favorable was employee reaction, it was decided a second series of six posters should be made up for posting throughout the plant.

•

Green Light Saves Scrap Losses

DANIEL BERG, Bridgeport, Conn.

When we were in our old plant, the metal-working machines were run at comparatively slow speeds. It was possible for machine operators to watch progress of the work, and the machines could be brought to a stop in extremely short order.

This condition is entirely changed in our new plant where the machines are new, and their speed of operation is about twice as fast as the old machines. It didn't take long for us to find out that it was a wonderful production advantage to have this increased speed. We are able to get things done in what seemed an unbelievably short period of time.

We learned also that with this greater speed we got into trouble faster and much more seriously. This was an angle that we had to remedy as quickly as possible, because we needed the production, and the money loss was extremely high.

The only sensible plan was to attack the problem of breakdowns and safety from a preventive standpoint.

We have bought many standard devices which forewarn the machine operators when something goes wrong, and these have all been worth many times what we paid for them. In some instances, we have applied simple, common sense gadgets which are worth their weight in gold.

On one of our new machines, the operator feeds a 600-lb. piece of metal. This is a big production job, and the time element is relatively short. Although it does not happen regularly, the power

(*Continued on page* 108)

Management, How Good Is Your Control?

Ask yourself these questions to check up

14. COORDINATION WITH NIGHT CREW

1. Does complete coordination exist between night and day crews?
2. Is there full cooperation with requests made by night crew? By day crew? Can anything be done to strengthen this cooperation?
3. Is contact or liaison between night and day lead men sufficient to insure smooth coordination of night and day work?
4. Is any special effort being made to see that day and night crews follow "standard" practices implicitly so as to eliminate variation in work procedures, methods, etc.?
5. Does each shift pick up exactly where the other left off? Or is there overlapping of work and time wasted trying to determine what the other shift has or has not done?
6. Has a spirit of friendly cooperation been developed between the two shifts? If not, have you taken steps to initiate it?
7. Can use of equipment by night and day crews be better coordinated? Are parts racks, assembly benches, cleaning units, machines, and other equipment used by both crews for the same purposes and in the same manner?
8. Does one crew upset the parts racks, cleaning unit, assembly benches, and machine tool layouts and dispositions of the other? How can this be overcome?
9. Would a system of written "change-over" instructions from one shift to the other be of value? If kept brief and simple?
10. Do night and day crews clearly identify their respective outputs so as to eliminate any dodging of responsibilities?
11. Is there a decided difference in quality and quantity of day and night production? If so, have you looked for the causes? Have you remedied them?
12. Is night inspection as complete as day inspection?

Next Month: Tools

Prepared by HARDING PALMER, *Industrial Engineer*

Lockheed Aircraft Corporation, Burbank, Calif.

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

CONTENTS OF THIS ISSUE

Editorials 82

Oiling by Schedule Keeps Our Machines Running
Nels Swenson 83

Electric Immersion Heaters Lick Many a Job..*H. M. Chatto* 86

A New Way to Insulate Sidewalls and Roofs..... 88

Ten Ways to Make Cranes Work Better, Last Longer
F. M. Blum 90

Instrument Board Supplies All Control Data...*O. E. Bishop* 93

Lighting to Stop Sabotage.....*Davis H. Tuck* 95

Maintenance Shorts 98

Data Sheets: Direct Current Control Circuits..... 102

What's New in Equipment..... 122

Catalog Service 216

MAINTENANCE CONTENTS OF THE FOUR PRECEDING ISSUES

JULY

Timers Make No Mistakes..... 87
Budgeting a Year's Maintenance..... 89
Process Control—by Loudspeaker..... 91
Don't Let Fire Delay Defense..... 93
Moving Out the Chips..... 96
Built to Get More Hiring Space..... 93
Maintenance Service Shorts.....100
Data Sheets: How to Change and Reverse Speed on A.C. and D.C. Motors.....106
What's New in Equipment.....122
Catalog Service 206

AUGUST

Twenty-Four-Hour Maintenance
Case No. 20—No Time Out for Breakdowns..... 94
Case No. 21—Ready for 24-Hour Operation..... 95
Insuring Plant Protection
Case No. 48—Guards Against Stoppages.....147
Case No. 49—Fire Defense First.....149

SEPTEMBER

Buy the Crane That Does the Job..... 83
Before You Reapply Motors..... 87
Our Test Instruments Work 24 Hours a Day..... 90
New Circuits, Better Welds..... 92
Budgeting a Year's Maintenance..... 94
When Unit Heaters Go to Work..... 97
Maintenance Shorts 102
Data Sheets: Fluorescent Lamp Troubles — Causes and Remedies 106
What's New in Equipment.....122
Catalog Service 214

OCTOBER

Built to Foil the Saboteur..... 83
Flame Cleaning Helps Save the Surface..... 86
How to Add Years to Centrifugal Pump Life..... 88
Don't Let That Fire Start..... 91
Electric Immersion Heaters Lick Many a Job..... 82
"Hanging" the Roof Saves Floor Space..... 95
Maintenance Shorts 96
Data Sheets: Connection Diagrams for Pushbutton Circuits...100
What's New in Equipment.....118
Catalog Service 202

FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Don't Stop a Freeze at the Cost of a Fire

SHUTTING SPRINKLER VALVES is a highly effective way of keeping the lines from freezing—but it is also the worst possible way to solve the problem. This fact is something to keep prominently in mind whenever the mercury starts to slide down.

If it could be known just where fire will break out, there would be small difficulty in stationing a man at each closed sprinkler valve, so that it could be opened at the appointed moment. But fire does not operate according to a timetable. It is more likely than not to break out at the most unexpected times and places. Therefore, any gamble with fire means taking chances whose odds it is hardly possible to estimate.

If it is impossible or undesirable to provide sufficient heat to keep sprinkler lines from freezing, recourse may be had to dry-pipe valves, air check valves, or non-freezing solutions.

The cost of these safe alternatives is a small price to pay for the assurance that sprinklers are ready to go into action, automatically, the instant they are needed.

There Are Many Ways to Get More Floor Space

WHERE AND HOW to get additional space is a troublesome problem in many plants. This problem had reached serious proportions in one large concern before it occurred to the plant engineer that homemade wooden shelves and bins take up much more room than those made of metal. Accordingly all the old, heavy wooden shelving was torn out—and there was lots of it—and replaced with steel equipment of the latest design. This simple change increased floor space 25 to 50 percent in some areas. In addition, the appearance of the shop was greatly improved, and the fire hazard was definitely reduced.

In another plant the production department's demand for more room was met, easily and at low cost, by erecting a second floor midway between the first floor and the roof of a large building. Whatever the reason for putting the roof 40 feet above the floor, it had long since ceased to have weight. Floor area of the building was thus doubled by the addition of a floor heavy enough to support a light assembly department, plus a new lighting system for the first floor.

Then there's the New England plant (see page 64) that by the use of inventiveness and mechanical handling equipment turned an unproductive second floor into assembly, finished goods storage, and shipping departments.

Erection of an inexpensive roof between two buildings in another plant created a perfectly satisfactory storage area that permitted thousands of square feet of space within the buildings to be turned over to production.

Simple ways out, of course. To be sure, these expedients could not be used in every plant. On the other hand, there are comparatively few plants in which extra space couldn't be made available if imagination and ingenuity were put to work on the problem.

Make Equipment Last Longer— You May Not Get Replacements

AMONG THE HOST OF PROBLEMS confronting maintenance men are two that aren't to be solved by a wave of the hand. These problems are, "How to get maximum service from every piece of equipment," and "How to get maximum life from this equipment."

The first problem follows naturally from the unescapable necessity to keep production at the highest possible peak until defense and other needs have been met. Getting maximum life out of equipment is a requirement imposed by the simple fact that the supplies of all important metals and materials are definitely limited. Therefore it is to be expected that getting new equipment, parts, and materials will not be simply a matter of placing an order.

Plants working on defense contracts will, of course, have first call on whatever is available. Other plants will have to get along on what is left over. It will be wise and patriotic for every plant, regardless of its status in the defense program, to prolong the life of its equipment as much as possible.

These three steps are essential to the success of any such undertaking: Proper selection; careful maintenance; constant vigilance to see that equipment is not abused. Equipment can be abused in many different ways, but it all boils down to a matter of causing unnecessary wear and tear by subjecting it to adverse operating, atmospheric, or other conditions.

The fact that this matter is often overlooked does not lessen its importance. Abuse in one form or another prevents a great deal of industrial equipment from rendering the length of service it is really capable of giving.

Twenty-four-hour operation intensifies the need for proper lubrication

Oiling by Schedule Keeps Our Machines Running

One lubrication man to one hundred machines is the new Warner & Swasey formula that replaced the old-fashioned system of making each operator responsible for oiling his own. Average maintenance cost per machine is down 6 percent

NELS SWENSON, General Superintendent, The Warner & Swasey Company, Cleveland

With 24-hour-a-day operation, no chances are taken—oil changes are made ahead of schedule rather than risk a machine breakdown

ROUND-THE-CLOCK OPERATION forced us to change our lubrication system. For 20 months prior to the declaration of a national defense emergency, our plant had been running 24 hours a day. Machine breakdowns were increasing in number. Repairs were costly. Valuable production time was being lost. Need for a more adequate lubrication system was plain.

Under the old system of lubrication, machine operators were responsible for the lubrication of their machines. An adequate supply of oil was kept in each department. However, with three-shift operation, expansion of our plant, and influx of large numbers of new men, lubrication of machine tools was not adequately performed and sometimes it was neglected entirely.

A contributing factor to the laxity of the operator is that modern machine tools have definite specifications on lubrication, and as many as five different lubricants are used on some machines. The ordinary mechanic does not understand lubricants. He often used the wrong kind—resulting in a breakdown or rapid loss of the accuracy of a machine due to wear. In addition to revising the system, a thorough check was made into the lubricants that we carried in stock, changes were made, and the number of oils was reduced about one-half.

It was decided to hire men who would do nothing but lubricate machines. Our experience shows that one man can have under his supervision approximately 100 machine tools. On his rounds the lubrication man takes along a cabinet on wheels, in which he keeps his measures, funnels, grease guns, small quantities of special oils, and lubrication charts.

To give the lubrication men complete information on where to lubricate, what lubricant to use, and the frequency of lubrication, we have made a lubrication chart for each machine. The lubrication chart is made up on 8½ x 11 tracing cloth, and two blueprints are made. Machine equipment numbers are written on the blank space and designate the machines in the department covered by that chart. Since one chart may take care of a group of the same type of machines, our records are thus simplified. One blueprint copy is kept on file in the office, and the other is placed in a transparent shop envelope. If the same type of machine is used in other departments, additional blueprints are made for their records. The transparent shop envelope containing the lubrication man's blueprint is kept in his cabinet, for ready reference. We had considered hanging a lubrication chart on each machine, but a trial showed it became soiled and lost. The lubrication man soon learns what oils are needed and does not often have to refer to the charts.

When the lubrication man takes

care of periodic reservoir oil change, he writes the date opposite the equipment number on his chart. He also reports the oil change to the office, so that the office file is kept up to date. If written in pencil the dates can be erased many times before a new blueprint is needed.

The information placed on the lubrication chart was obtained in most cases from the machine manufacturer through service manuals, machine instruction plates, and lubrication instructions that accompany most of the incoming new machines. In some cases letters written to the manufacturers brought complete information. However, in order to standardize and simplify our line of lubricants, we did not adhere strictly to manufacturers' recomendations, but compromised on specifications such as viscosity, brand names, and grades of oil.

The following lubricants take care of practically all our requirements:

Type of Lubricant	Saybolt Viscosity at 100° F.
Spindle oil	125
Turbine oil—light	150
Machine oil—medium	180
Machine oil—heavy medium	280
Turbine oil—heavy medium	320
Machine oil	1000
Gear oil—SAE 140	3000
Grease—plain bearing	
Grease—antifriction bearing	

For ordinary lubricating use throughout the plant, we use a heavy-medium lubricating oil that has a Saybolt viscosity of 280 seconds at 100 degrees Fahrenheit. This oil has an additive that gives it the ability to cling to metal and thus do a better job of lubricating than an ordinary machine oil. Our gear oil has a mild extreme pressure additive that increases the film strength and preserves the life of the gear teeth.

Turbine oil, light and heavy medium, is used as hydraulic oil in hydraulic drives on machine tools. We use turbine oils in hydraulic reservoirs because it is a highly refined oil and the best oil is needed to perform the strenuous work that hydraulic oils must do. We demand an oil that will resist oxidation to the greatest degree. Highly oxidized oils form gums and sludges, which interfere with the operation of the valves and pump mechanisms. Gums and sludges are especially harmful where vane or variable stroke piston pumps are used. Replacement parts and labor costs for repairs to hydraulic systems can be expensive, and our experience has shown that a high-grade hydraulic oil is the least expensive in the long run.

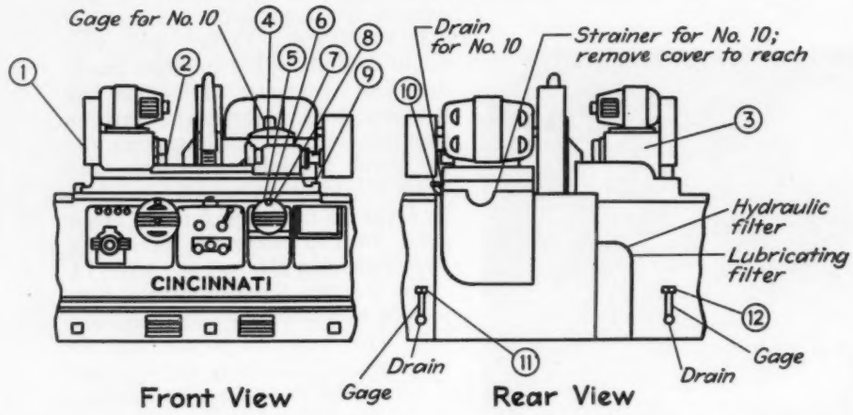
Oils and greases are stored in a building separated from our other buildings. The man in charge of the oil storage writes up a charge card for all oil ordered. Also he delivers oil with an electric platform lift truck. The oil is delivered in barrels to various locations in the plant where the lubrication men have easy and quick access to them. Barrel pumps are used to pump the oil from the barrels to the lubricating men's containers.

Not all oil is distributed in barrels. Oil which is not used in large quantities is stored in 5-gallon or 12-gallon containers having either faucets or pumps. Although we use barrel pumps, faucets, and barrel rocker stands, we find that barrel pumps require less room and eliminate the problem of leaky faucets.

Oil changes are made in all reservoirs in periods varying from 6 to 12 months, depending on the way the oil stands up. We have checked the condition of the oil in different types of machine tools after various periods of use and have determined at about what interval it is best to change. Our machines have been in continuous 24-hour-a-day service during this emergency, so we play safe and change oil a little ahead of time, rather than take a chance on the oil deteriorating with resulting machine breakdown.

When we send an oil sample out for test, we watch the following indications carefully: (1) The acid condition of the oil as shown by the neutralization number; (2) the ability of

LUBRICATING INSTRUCTIONS — CINCINNATI 10×36 GRINDER



When to oil	Station No.	Lubricating instructions	Lubricant	Equip. No.	6 mo. oil change *
Once a shift	1 to 3	Small amount grease applied with grease gun	Cup grease		
	4 to 9	Fill with squirt gun	Medium lubricating oil		
Once a week	10 *	Check reservoir, if necessary add oil. Every six months drain and refill with clean oil. Also clean strainer	Spindle oil		
	11 *	Check reservoir, if necessary add oil. Every six months drain and refill with clean oil	Light hydraulic oil		
	12 *	Check reservoir, if necessary add oil. Every six months drain and refill with clean oil	1000 Vis. E.P. lubricating oil		

* NOTE: Every six months clean hydraulic and lubricating filters. Also clean the strainers at the ends of the table

N. B. H.

A chart for each machine tells the lubrication man when and where to lubricate, and what lubricant to use. One copy of the chart stays in the office file, the other travels with the man

In the cabinet on wheels that the lubrication man takes with him are funnels, grease guns, special oils, and lubrication charts. One man can supervise the oiling of approximately 100 machine tools

the oil to separate from water as shown by the steam emulsion rate.

As soon as the neutralization number reaches 1.0, the oil is replaced. The dangers of using oil with an acid condition are the corrosion of metals and the formation of sludges.

When the steam emulsion number reaches approximately 500 seconds, the oil is replaced, because oil would emulsify readily if water were present. An emulsion promotes the collection of grit and foreign matter in the oil. When these particles are carried through bearings, they act as abrasives and cause excessive wear. If an emulsion breaks quickly, its harmful effects are reduced. A highly filtered and purified oil will separate quickly and, for this reason, should be used in circulating systems where the oil is repeatedly used over again. A new oil used in a machine tool reservoir circulating system should have a steam emulsion number below 60 and a neutralization number below 0.05.

The possibilities of savings by purchasing oil in larger quantities should be investigated. The largest savings are obtained by purchasing bulk oil in tank cars. Tank cars of 6,000, 8,000, and 10,000 gallons are available, and savings in cost up to 20 percent are possible. With tank car shipments it is necessary, of course, to have adequate tanks to handle the incoming oil.

Smaller Quantities

It is possible to get 6,000-gal. tank cars with 3 compartments holding 2,000 gallons each. These are convenient and permit you to order smaller quantities of oil and still take advantage of the tank car price.

Savings up to 12 percent may be made by purchasing oil in freight car quantities of 65 barrels. Many oil companies will permit you to order different types of oil in the 65-barrel shipment. It is also possible to purchase bulk oil in trucks, but because of the shortage of these trucks, it is difficult to get this service. Savings up to 6 percent may be made by buying in truck load quantities of 45 barrels.

We keep records of our maintenance costs and find that in spite of the additional strain on our machine tools because of the 24-hour-per-day service, our maintenance cost per machine has gone down since we introduced the lubrication system. Comparing the first half of 1940, when we had no lubrication men, with the first half of 1941, our average maintenance cost per machine, including labor, repair parts, shop overhead, and lost time, dropped about 6 percent. How much of this drop can be attributed to lubrication, is difficult to determine, but the trend is in the right direction. These immediate results are gratifying, but we expect the efficient lubrication that our machines are now receiving will extend their life and accuracy in the years of service ahead.

Many plants with defense contracts have new heating problems that demand solution

Electric Immersion Heaters Lick Many a Job

But one of the essentials to satisfactory performance of an installation is correct calculation of the amount of heat required. This article explains how to do it

H. M. CHATTO, Industrial Heating Specialist, General Electric Company, Boston

APPLICATION of electric immersion heaters in solving a wide variety of industrial heating problems was explained in an article in the October issue. In that installment, the standard types of immersion heaters available for different kinds of service were described, together with the general principles that govern their installation and use.

A widespread application is the use of immersion heaters for preheating fuel oil. An installation usually consists of one or more heaters inserted into the pipe line from the storage tank to the burners and located so as to deliver hot oil effectively at the burners. Thermostatic control and electrical interlocking with pump motors make for safe operation.

The screw-in immersion-type heater is easily installed. It is necessary only to drill a hole in the tank or vessel to be heated and cut a standard pipe thread. Unless the wall is ⅜ inch or more in thickness, it should be reinforced with a metal plate.

If heaters are installed in pipes, the minimum standard size for heaters with the 1¼-in. threaded collar should be 1½ inches. Heaters with a 2-in. collar should not be installed in pipe less than 2½ inches in diameter.

Keep Them Clean

Keep immersion heaters clean. Provide free circulation of liquid around them at all times. Inspect regularly and remove any accumulation of carbon or foreign material.

Screw-in heaters may be installed either vertically through the bottom of the tank or through the side, and must be covered with at least 2 inches of liquid. Do not install this type of heater vertically from the top of a tank, because variations in liquid level may result in exposure of the heater. Also, when water is being heated, steam pockets tend to form, which overheat the units.

The over-the-side type of electric immersion heater is installed very easily, since it slips readily over the edge of a tank with the terminals hanging down on the outside walls.

During operation the active heating portions of all immersion heaters should be entirely immersed to prevent overheating—a condition that will cause the heaters to burn out in a short time.

Insulate tanks, kettles, and process machines as thoroughly as conditions will permit, because the savings will soon repay the cost. In general, for low-temperature applications 1 inch of insulation for each hundred degrees Fahrenheit above ambient is advised.

Losses from the tops of open tanks are in some instances several times all other losses. Special attention should be given to using insulated covers when possible.

For convenience in making heating calculations it is best to consider the energy of heating-up separately from the energy required for production. Heating-up energy includes the heat absorbed by the tank or machine including the contents plus the radiation losses during the heating-up period. The energy used during production hours consists of heat losses plus the heat going into the product.

The table shows the energy required for heating water. Similar values for oil will be about four-tenths of the corresponding figures for water.

Energy Required to Heat Water, Kilowatt-Hours

Gallons	*Temperature Rise, Degrees Fahrenheit*									
	10	20	30	40	50	60	70	80	90	100
1	0.024	0.040	0.073	0.098	0.12	0.15	0.17	0.19	0.22	0.24
2	0.049	0.098	0.15	0.19	0.24	0.29	0.34	0.39	0.44	0.49
3	0.073	0.15	0.22	0.29	0.37	0.44	0.51	0.59	0.66	0.73
4	0.098	0.19	0.29	0.39	0.49	0.59	0.68	0.78	0.88	0.98
5	0.12	0.24	0.37	0.49	0.61	0.73	0.85	0.98	1.1	1.2
10	0.24	0.49	0.73	0.98	1.2	1.5	1.7	1.9	2.2	2.4
15	0.37	0.73	1.1	1.5	1.8	2.2	2.6	2.9	3.3	3.7
20	0.49	0.98	1.5	1.9	2.4	2.9	3.4	3.9	4.4	4.9
30	0.73	1.5	2.2	2.9	3.7	4.4	5.1	5.9	6.6	7.3
40	0.98	1.9	2.9	3.9	4.9	5.9	6.8	7.8	8.8	9.8
50	1.2	2.4	3.7	4.9	6.1	7.3	8.5	9.8	11.0	12.2
60	1.5	2.9	4.4	5.9	7.3	8.8	10.2	11.7	13.2	14.6
70	1.7	3.4	5.1	6.8	8.5	10.2	13.1	14.8	16.6	17.1
80	1.9	3.9	5.9	7.8	9.7	11.7	14.8	15.5	17.5	19.5
90	2.2	4.4	6.6	8.8	11.0	13.2	16.6	17.5	19.7	22.0
100	2.4	4.9	7.3	9.8	12.2	14.6	17.1	19.5	22.0	24.4

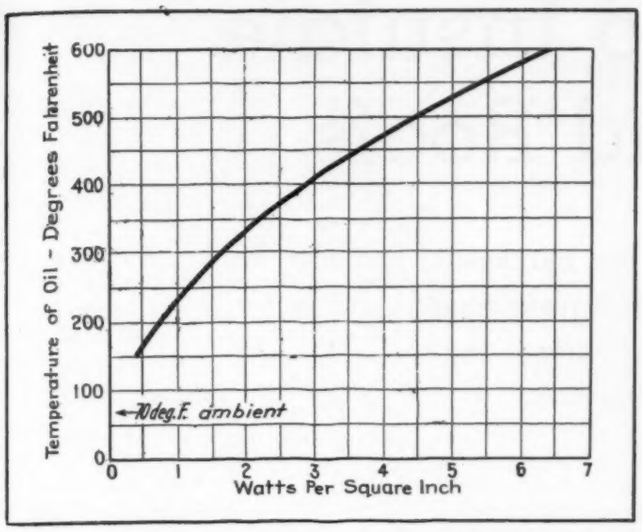


Figure 1. This curve shows the heat losses from the surface of oil baths that are operated without a cover

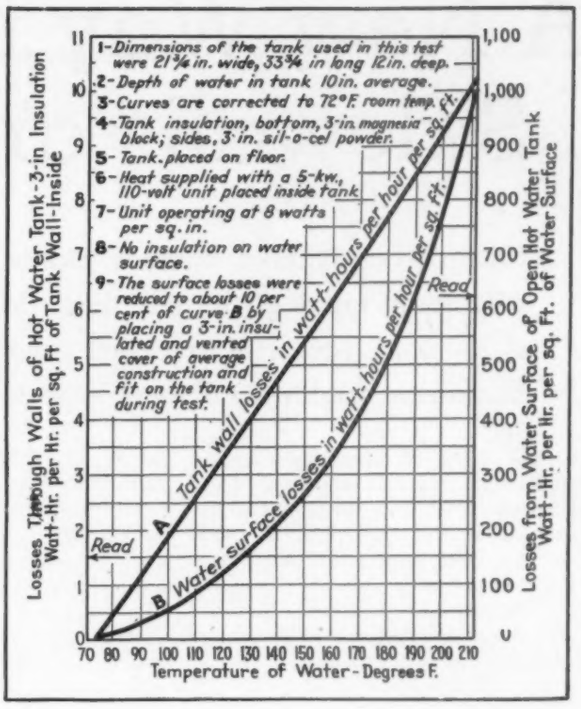

1-Dimensions of the tank used in this test were 21¼ in. wide, 33¾ in long 12in. deep.
2-Depth of water in tank 10in. average.
3-Curves are corrected to 72°F. room temp.
4-Tank insulation, bottom, 3-in. magnesia block; sides, 3 in. sil-o-cel powder.
5-Tank placed on floor.
6-Heat supplied with a 5-kw., 110-volt unit placed inside tank.
7-Unit operating at 8 watts per sq. in.
8-No insulation on water surface.
9-The surface losses were reduced to about 10 per cent of curve B by placing a 3-in. insulated and vented cover of average construction and fit on the tank during test.
Losses Through Walls of Hot Water Tank-3-in Insulation Watt-Hr. per Hr. per sq. Ft of Tank Wall-Inside
Losses from Water Surface of Open Hot Water Tank Watt-Hr. per Hr. per sq. Ft. of Water Surface
A Tank wall losses in watt-hours per hour per sq. ft.
B Water surface losses in watt-hours per hour per sq. ft.
Read
Read
11 10 9 8 7 6 5 4 3 2 1 0
1,100 1,000 900 800 700 600 500 400 300 200 100 0
70 80 90 100 110 120 130 140 150 160 170 180 190 200 210
Temperature of Water-Degrees F.

Figure 2. From these curves the heat losses from open hot water tanks can be determined

Expressed in kilowatt-hours, the energy required to heat liquids is (*Wt., Lb.*) x (*Av. Sp. Ht.*) x (*Temp. Rise, Deg. F.*) ÷ 3,412.

For example a 300-deg. F. rise in temperature of 10 cubic feet of machine oil weighing 58 pounds per cubic foot and having an average specific heat of 0.40 would require:

(580 x 0.40 x 300) ÷ 3,412 = 20.38 kilowatt-hours.

This is the general method of calculating the heat absorbed by liquids. In the example above, the energy required for heating the oil only has been calculated. If the oil were in a steel tank (specific heat 0.12) weighing 200 pounds, the additional energy required to heat the tank would be:

(200 x 0.12 x 300) ÷ 3,412 = 2.1 kilowatt-hours.

These two requirements total about 22.5 kilowatt-hours. With 22.5 kilowatts in heaters the tank would heat up in 1 hour, except for radiation losses that would slow it up slightly. How much would the heat losses be?

Assume that a tank having a properly insulated cover is 4 feet long, 3 feet wide and 2 feet high, outside dimensions. The external surface area is 52 square feet. From the curve in Figure 7 (October, page 94) it will be seen that for 51 square feet and 300-deg. F. rise the losses with 1 inch of insulation are 4.5 kilowatt-hours per hour. With 3 inches of insulation these losses could be cut to 1.5 kilowatt-hours. Since these losses would be supplied by the heaters in about 1.5 ÷ 22.5 = 0.07 hours, the delay would be small.

Actually, when starting cold, the average losses during heating-up time would be about one-half this value.

If the tank is operated without a cover, the losses will be much greater. They can be determined from the curve that Figure 1 shows.

Use the curve shown in Figure 2 for an open hot water tank.

Heat energy required to do the work for which this tank is used must now be considered. If the tank must supply so many gallons of hot oil per hour, just add the necessary energy calculated in the same way as before. The same procedure applies when hot water is periodically drawn from a tank. Assume, however, that 300 pounds of sheet steel articles (specific heat 0.12) are dipped in this tank each hour. Then the energy to be added is easily determined by using the familiar formula again. That is:

(300 x 0.12 x 300) ÷ 3,412 = 3.17 kilowatt-hours.

To summarize this specific problem: Assuming automatic temperature control and 3 inches of insulation, with a cover used when the tank is not in production, kilowatt-hour requirements are:

Energy to heat oil	20.38
Energy to heat tank	2.10
Losses while heating up in one hour with cover on	0.75
Total energy to heat up	23.23

Energy required for production is:

Radiation losses from top of tank	2.20
Radiation losses from walls	1.50
Energy to heat 300 pounds steel per hour	3.17
Total energy for production	6.87

It will be noted that the energy needed to heat the tank in 1 hour is about four times the amount needed for production. Therefore, it is uneconomical to apply more than 12 kilowatts to this tank. Twelve kilowatts will heat it in about two hours after a week-end shutdown and in less time after an overnight shutdown.

It must be remembered that all liquids have the characteristics of absorbing a very large amount of heat as compared to that absorbed by the same weights of metals and most other substances. For example, ten times as much energy is required to heat a pound of water through 100 degrees as is needed for a pound of copper. Therefore, allow a long time for heating liquids in tanks and containers because in almost every instance the heat needed for the work is only a fraction of what is required for quick heating-up. If this is done there will be less equipment to buy, and often lower demand charges in power costs.

Calculations given previously for an oil tank are typical. The same procedure will apply to cleaning tanks using water solutions or to water tanks for washing purposes. For pressure vessels, such as generators, the use of steam tables makes calculations easy.

A New Way to Insulate Sidewalls and Roofs

New air-conditioned bomber plants are blanketed with three types of fibrous glass. Heat transference is reduced, sound is absorbed, and a surface that maintains brightness at high level is obtained

A NEW TYPE of shatterproof, noncombustible sidewall and roof construction combining three types of glass fiber and prefabricated steel panels is being used to insure insulation and acoustical control for working efficiency in the twin 4,000-ft. long Army bomber assembly plants being erected by the Austin Company at Fort Worth, and Tulsa.

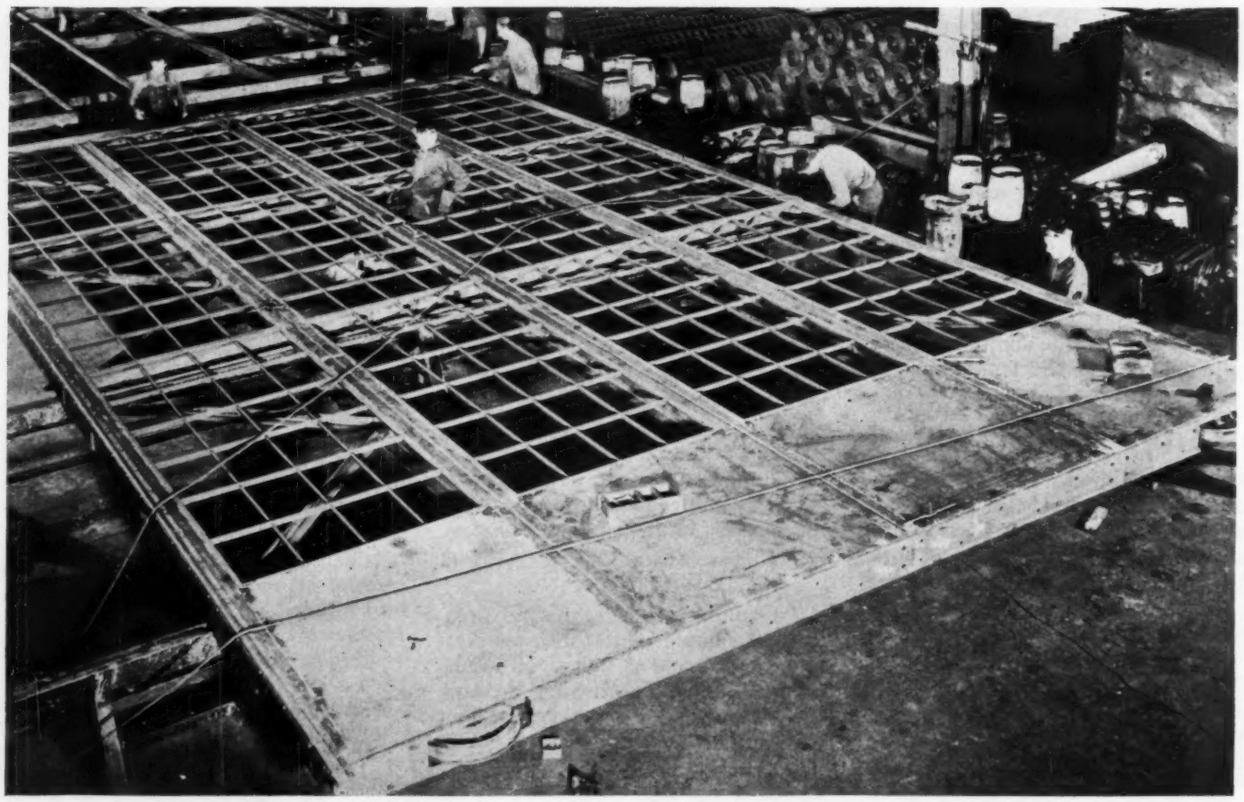
A total of 406 carloads of glass fiber was required for these jobs—203 carloads for each plant. They will probably contain more glass in their windowless steel side walls and roofs than the largest daylight factories ever built. By blanketing all interiors with several layers of these materials, which are calculated to eliminate or control all condensation and to reduce heat transference to a minimum, the cooling load has been greatly reduced.

Alternate layers of glass wool and special vapor seal paper, held together with asphalt, are combined with steel channels, roofing sections, and metal lath to give the walls and roofs strength and high acoustical, insulating, and light-reflecting qualities.

Because all the 171 200-ft. trusses required for the main aisle of each plant are 25 feet deep and an equal number of 120-ft. trusses for the side aisle 16 feet deep—all too high for shipment of any completed segments by rail—they are being assembled entirely on the site. While most of these spans weigh 40 tons and 25 tons and can be assembled on the ground and raised into place in one piece, 115-ton jack trusses of 200-ft. span are being assembled in place with the aid of heavy falsework.

One Hangar Door

Only one 200-ft. hangar door opening has been provided in each plant, that being at the end of the assembly line. These doors, and eight 200-ft. doors in the nearby hangar building, will be of the vertical lift type, installed in units 100 feet wide to oper-



Hangar doors, 200 feet wide, are of the vertical-lift type. Each will be installed in 100-ft. units that operate independently of each other. All doors will be insulated in a manner comparable with the sidewalls, with weatherproofing at jambs in keeping with the requirements of air-conditioned buildings

Unrolling some of the white glass wool that blankets roofs and walls of the bomber assembly plants being built at Forth Worth and Tulsa. Runner channels, which are welded to the steel purlins, support the ⅜-in. ribbed expanded metal lath on which is first spread a thin mat of light-reflecting fibrous glass mat, then a 3-in. blanket of the white glass wool. This, in turn, is covered by a metal deck. Note how the men lap the edges to insure complete coverage. Several layers of vapor seal paper, asphalt, and fibrous glass insulating board are yet to come before roofing is applied

ate independently of each other. Four 150-ft. single unit doors of the same type will be used in the paint shop. All will be 40 feet high and insulated in a manner comparable with the sidewalls, with weatherproofing at jambs in keeping with the requirements of air-conditioned buildings.

Shatterproof Building

Assembly buildings and a majority of the auxiliary structures at each plant have an over-all height of 65 feet. A 13-in. curtain wall of face brick and acoustic block, reinforced with trussed rods to make it shatterproof, rises to a height of 12 feet around the base of all buildings. The special insulated metal wall extends from that point to the roof. Glass fiber insulation board continues right down to the base of all walls through the masonry, to insure absolute control of condensation. Even the bolts used to anchor the upper walls to steel girts are being insulated to prevent continuous steel contact between exterior and interior.

By blanketing the interior walls of each structure with white glass fiber, the engineers have not only provided for insulation and absorption of between 60 and 75 percent of all factory and office noises, but have also obtained a light-reflecting surface that will maintain brightness at a high level. Each assembly building will have 17,000 two-tube 200-watt rectified (RF) fluorescent units to provide at least 35 foot-candles at the working plane. A white cement floor will enhance the general lighting efficiency by reflecting light up on the underside of parts and planes on the assembly lines.

Each plant has been designed with two mezzanine levels alongside the assembly line, for storage of various parts and subassemblies convenient to the particular assembly station where they will be installed.

It was necessary to provide some passage for monorails from aisle to aisle at intervals along the assembly line. This need has been met by limiting the length of mezzanines to 450 feet so that there are seven 50-ft. transfer aisles available for monorail crane connections, resulting in the creation of 8 separate mezzanines at each level, 30x450 feet, served by 8 rotary lift hydraulic elevators large enough to handle all but the heaviest parts and bulkiest subassemblies.

Food wagons, first aid stations, tool cribs, washrooms, and toilets will be located directly below the mezzanines or on them so that nothing will obstruct the free operation of the interconnecting monorail systems that will serve the entire area of each assembly building. They will be capable of carrying a fully assembled 4-engine bomber the entire length of the assembly aisle, or of transferring other overhead loads up to 20 tons between any two points in the building.

Parallel Conveyors

Bombers will progress through the final stages of assembly on parallel conveyors extending nearly 2,000 feet through the assembly aisles, every portion of which will be served by a network of power lines in some 10 miles of underfloor service duct.

The glass fiber products, including mats, board, and wool, for roofs alone, will total more than 5,000,000 square feet at each location, and an additional 2,300,000 square feet of these same products will be used in the sidewalls. The combined weight of these glass materials averages only 1 pound per square foot of wall and roof surface.

From now on it's going to be increasingly difficult to replace worn-out equipment

Ten Ways to Make Cranes Work Better, Last Longer

Right lubrication, constant watchfulness, and checking at the ten points noted will keep overhead traveling cranes running at their full capacity

F. M. BLUM, Assistant Manager, Crane Division, Harnischfeger Corporation, Milwaukee

CERTAIN MACHINERY which may have been neglected during lean years is in the present emergency being taxed to its utmost capacity. Particularly is this true of overhead traveling cranes. Also, owing to the great demand, many old cranes have been reconditioned, sold, and put into service in plants that could not wait for new equipment. Therefore it is unusually important to stress the care that should be given to maintenance of all overhead traveling cranes.

Many of us think the maintenance of cranes consists primarily of doing an oiling and greasing job. This is only partially correct. If lubrication is done by the crane operator, or someone well qualified to include in this lubricating problem inspection of the crane's working parts, then the maintenance problem is greatly simplified. Worn parts will be discovered and replaced before failures occur. Failures not alone lose production hours, but also may cause serious accidents. If a crane is lubricated by someone who is compelled to check each and every lubrication fitting, gearcase, and journal, condition of vital parts is noted before failures occur. This method of combined lubrication and inspection reduces crane maintenance to a minimum.

One of the first requisites for crane maintenance, is the crane runway. A correct runway must be provided and maintained. It should be of a satisfactory size for the wheel loads, and not less than the size specified by the crane builder. Rails should be of the correct span, center to center, throughout its entire length, with both rails level and on even elevation. A correct span should not vary by more than $\frac{1}{8}$ inch plus or minus in the center to center measurements or out of a straight line in the length of the runway. Runway must be of sufficient strength to avoid undue deflection between columns, and supported sidewise to withstand the starting and stopping of trolley with load. A poor runway is a continuous source of trouble and a cause of excessive wear of bridge truck wheels and bearings.

1. Follow lubrication instructions
2. Maintain motor brakes
3. Keep bridge brake adjusted
4. Test limit switch at each shift change
5. Keep all screws and bolts tight
6. Keep crane and bridge clean
7. Test brushes and control contacts
8. Replace kinked or worn cables
9. Keep truck wheels aligned
10. Check main line and trolley collectors

The amount of care required for inspection and maintenance depends primarily on the continuity of service to which the crane is subject. Ten rules for crane maintenance are briefly given and described herewith:

1. Keep the crane lubricated in accordance with instructions on your lubricating chart. Do not allow oil to get on motor brake, wheel, or shoes. Be sure lubricants are clean and of good quality. Wipe up all spilled and excessive lubricants.

Avoid filling oil boxes too full or using a lighter lubricant than recommended, or leakage will result.

Axle bearings may be shimmed under the brass seats to prolong the service life of the bearing. As shaft bushings become badly worn or shaft-scored, replacements must be made to maintain lubrication of the bearings. On antifriction bearing cranes, bearings are installed in separate capsules or housings. This construction allows the removal of any bearing with its shaft for ease in replacement and provides the complete atmospheric seal at outside bearing point. At bearing points with through shafts, these seals protect against foreign matter.

As long as he can remember, F. M. Blum has been playing around with electricity. After he was graduated from the Boys Technical Electrical School, he studied in night school as well as taking a correspondence course—in electricity, of course. For seven years worked for Cutler-Hammer, drafting control apparatus. Last twelve years has been with Harnischfeger, designing control apparatus for overhead cranes and hoists. Plays golf, fishes, and does group work with boys' organizations at YMCA

Bearings must not be forced full of lubricant, as it will cause churning and heating on high-speed shafts. A light coating of proper lubricant will give maximum bearing life.

2. Adjust brakes according to instructions. Most a.c. hook service cranes are provided with a mechanical load brake plus the electric motor brake. Test mechanical load brake in the following manner: With approximately a 25 percent load on the hook, lift it 3 or 4 feet from the ground. Lower the load and at the same time throw out the main line switch, disconnecting power from the crane, and block the electric motor brake so it will not set. If the mechanical load brake is in good condition, it will then either hold the load suspended in air, or allow it to be lowered slowly to the ground.

The electric motor brake is used in both a.c. and d.c. operated cranes, and should be adjusted both to solenoid stroke and correct length of compression springs to provide the maximum holding qualities. This brake's primary function is to reduce the drift of the load in either direction of travel. When not operating properly it may cause serious damage to crane, work, and men. Replace electric brakeshoe linings before they become too worn. Excessive stroke of the solenoid plunger may prevent the brake from closing at light loads. Excessive spring pressure on the brakes may have like results.

3. See that bridge brake is adjusted and in operating condition. On older cranes, a mechanical foot brake is provided that operates the bridge motor brake through a long series of rods. It is well to lubricate these rods and pivot points, so that the operator's effort on the foot lever in the cage will not be lost in excessive friction to these parts. More modern cranes are provided with hydraulically operated footbrakes. Operating instructions should be followed. The greatest difficulty that can be encountered with a hydraulically operated brake arises from not having the system bled properly, and having air pockets in the fluid line from the master cylinder in the crane cab to the wheel cylinder in the brake. The maintenance of bridge brakes is highly important, as these brakes are the only means of stopping a crane bridge if power should fail.

Good maintenance starts with a clean and tidy crane. Using the platform for storage of brooms, grease pails, can cause serious accidents

4. Be sure that the limit switch is in operating condition at all times. The hoist limit switch on a crane provides a safety limit stop in the upward direction of travel. It should not be used as a stopping means for every lift. This limit switch should be tested by the crane operator at every change of shifts. If a limit switch is used as it is intended, as a safety device for the upper limit of travel and not as a stopping device, little trouble should be encountered.

5. The body-bound bolts, which hold the girders onto the end trucks, are fitted in reamed holes. Periodically these bolts should be tightened, as loose bolts will throw undue strain on the supporting members and cause misalignment. Also, the supporting bolts for gearcases should be checked periodically to prevent oil leakage.

6. Avoid accumulation of loose or foreign parts on cranes and keep free of excess dirt and grease. Good maintenance starts with a clean and tidy crane. Accumulation of grease and dirt on a crane may cause a serious accident by causing a man to slip and fall. The crane bridge platform should not be used as a storeroom for wrenches, extra bolts, and grease pails. Too frequently these things are jarred loose and fall upon men working below. Good housekeeping will prevent such accidents.

7. Be sure that all brushes and control contacts are clean and properly adjusted. Electrical equipment is the heart of the crane. On d.c. operated cranes, motors should be inspected periodically. Bearing housings should be kept about half filled with grease, a

small quantity being added about every three months with a hand grease gun. Approximately once a year bearing housings should be dismantled and all parts thoroughly cleaned with carbon tetrachloride. After reassembling the motor, necessary amount of grease should be applied to the antifriction bearing races. Carbon tetrachloride or grease should never come in contact with the windings. Cleanliness in handling antifriction bearings is imperative, as a small quantity of dirt or grit will rapidly destroy them. Removal of bearings requires that the puller jaws be applied at the back of the inner race of the bearing. Never take a bearing off by pulling on the outer race. Before being mounted on the shaft the bearing must be heated by immersion in hot oil.

Brushes should be checked to see that they are of proper length, pigtails are not binding, and the brushes are sliding free in the holder. Brush holders can be adjusted radially, to accommodate for commutator wear. Distance between the brush holders and the commutators should be within $\frac{1}{8}$ inch. The commutator requires frequent inspection and should be wiped off occasionally with a clean cloth. No wax, vaseline, or oil should be used on the commutator. If it becomes roughened or burnt, clean it with fine sandpaper, no coarser than No. 00, then wipe it off with a clean cloth. Never use emery cloth for polishing commutators. The mica between the commutator bars should be undercut to a depth of about $\frac{1}{32}$ inch. As the commutator wears, the undercutting should be renewed to be sure that no mica remains between segments. Spring tension on the brushes also should be checked and adjusted from $2\frac{1}{2}$ to $3\frac{1}{2}$ pounds per square inch of brush surface.

On a.c. motors care of the brushes on the sliprings is practically the same as that described for d.c. motors. Sliprings should be inspected periodically so that no pitting takes place. Never use lubricants on the sliprings.

Most industrial cranes are provided with drum-type controllers. Pivot points of these controllers should be lubricated occasionally, to assure easy operation. Inspect fingers and contact segments frequently, and, if rough, smooth off with a fine file or sandpaper, taking care to remove as little copper as possible. Contact parts should be removed before they are too badly worn.

Keep the fingers and segments well lubricated with clean vaseline. Oil or grease should not be used on contacts. Fingers of the drum controllers should be set so they have a wear allowance of approximately $\frac{1}{16}$ inch. If adjusted to a greater depth, stubbing of the fingers and hard operation of the controller will result, as well as excessive mechanical wear between finger and copper segments. Arc shields should be checked, and replaced if they are damaged, as their presence adds materially to the life of the contacts and fingers. Never operate a crane whose controller sticks or binds. It may cause a serious accident.

The crane protective panel is provided with fuses for protecting the various motors and should be checked periodically to see that the fuse clips maintain proper pressure on the fuses. Never tolerate fuse clips wired together—fuses are put into the circuit for protection of the motor and its parts. On modern cranes, where overload relays are used, little adjustment or maintenance is required as these overload relays are usually of the automatic reset type.

8. Replace all cables that are badly kinked or showing signs of dangerous wear. Hoisting cables furnished on the crane are of a selected grade. When replacement is necessary, use the type of cable originally furnished. If properly cared for, the usefulness of wire rope can be materially prolonged. Obtain a booklet that outlines care of wire rope, and follow these instructions for maximum rope life. If the rope shows signs of appreciable wear or broken strands, replace at once. Do not take a chance of dropped loads.

Careless operation can also inflict serious damage. Do not allow a load to be applied with a sudden jerk, especially by speeding the motor before the slack is out of the hoisting ropes or slings. Excessive side pulls may result in high stresses as well as the danger of a damaged cable by bending or kinking. Do not allow cables to operate out of drum or sheave grooves or overwind on the drum. Serious cutting of cable can result. Do not allow lack of lubrication, as it will cause corrosion and decay within the rope as well as external wear. Badly scarred drums or sheaves are the cause of rapid wear. Keep the rope grooves trued up, and replace them when badly worn.

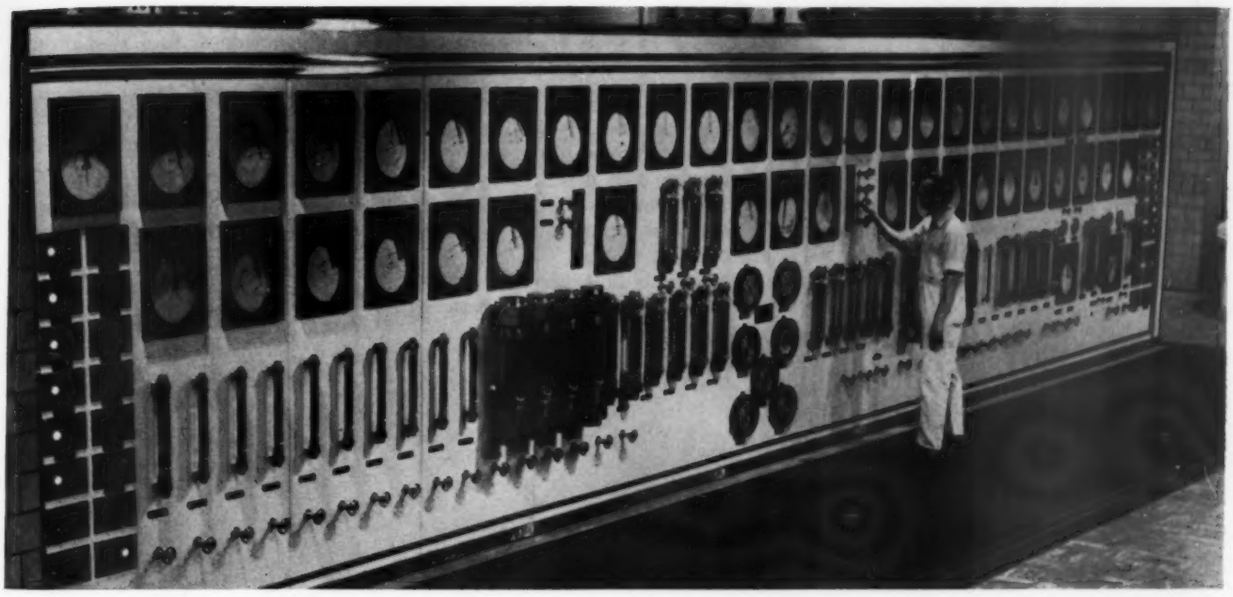
Keep the thrust bearing well packed with grease on the load hook. Annual check should be made to see that the load nut is not backing off the hook thread. If the crane is subject to consistent overloading or has been in heavy service for a period of ten years, it is recommended that the hook be annealed. Replace the hook when it is badly worn from contact with slings or lifting bales.

9. A badly misaligned runway, poor rail joints, misshapen runway rails or a wide variation in the size of the driver truck wheels, or the condition of the fillets are common causes of high wheel wear. Variation in driver wheels will cause the crane to operate out of square on the runway, with resulting flange wear against the side of the rail. To avoid this condition, it is necessary to keep the driver wheels paired or matched in size. It is recommended that not more than $\frac{1}{16}$ inch be allowed in the circumference of mating wheels. As a general rule, when the variation reaches $\frac{1}{8}$ inch, the wheels should be replaced with mating wheels or be refinished. Be sure to use a steel tape to measure corresponding points of circumference.

Bad track joints may cause flat spots or localized thread injury. Extreme variations in span may force the wheel flanges constantly against the rail heads and result in wear at that point, as well as thrust wear on the axle bearings. Keep runway spans correct. On runways that require constant attention to keep in span, taper thread wheels may reduce the amount of care required. A minimum total clearance of $\frac{3}{4}$ inch over the rail head must be provided, with a recommended clearance of $1\frac{1}{2}$ inch to allow the taper thread to be effective.

10. Maintain main line and trolley collectors with the correct tension, or replace if badly worn. All conductor systems should be maintained straight and true, keeping the contact surfaces clean and polished. Collectors must be adjusted to maintain their contact pressure over all points on the collector. Cast iron and steel surfaces must be free of rust and scale. A light coating of graphite in oil or grease to resist corrosion is recommended. Oil all hinges and spring connections occasionally. Keep all terminals tight, and be sure current shunts are in place. Be sure to free collectors and conductors of snow and ice before putting outdoor cranes in service.

These ten points briefly cover the majority of maintenance problems on overhead traveling cranes. If cranes are properly inspected, and worn parts are replaced before a breakdown occurs, the maintenance problems will become simple.



Any deviation from normal shows up at once on Calvert's big central board, with its 161 controls

Instrument Board Supplies All Control Data

Instruments provide constant control of temperatures, times, and concentrations. Central board shows what's happening everywhere. When anything does go wrong, maintenance can check it before quality or production is affected

O. E. BISHOP, The Calvert Distilling Company, Louisville

On the second floor of our still house there is an instrument board that demands the attention of any engineer or manufacturer who sees it. We are distinctly proud of our controlled industry, regulated by and represented by the instrument board. It is the most complete in our industry, and it is exceeded by few, if any, manufacturing plants of comparable size in any industry.

Instruments fit into our processes in several ways. Primarily they provide a constant control on temperatures, pressures, times, and concentrations so that we can maintain quality precisely at our specified levels. Secondarily they keep us informed of the functioning of all vital equipment, and our maintenance crews can correct any variations from the ideal condition before they have an opportunity to affect production or quality adversely. They are, therefore, part of our production control and part of our maintenance control. Because they are teamed together, it is difficult to say of many an instrument in our plant that it is strictly production or strictly maintenance. Usually it serves us in both of these respects.

Two Basic Steps

Two of the basic steps in making alcoholic beverages are fermentation and distillation. By far the greater instrumentation is required in distillation, but we do not wait until the material in process reaches the stills to start our precise controls. The secret of getting the fermentation to produce the desired reactions, once the correct materials are brought together in the fermenter, is to hold constant the optimum temperature and all other variables. On each of our fermenters we have recording controllers. Fermentation generates heat; the fermenter is water-cooled. Instruments operate the cooling-water valves and hold the mash at the correct temperature necessary for ethyl-alcohol fermentation. With fermentation completed, the beer (technical name for fermented mash) goes to distillation in the stills.

Steam is used for cleaning and sterilizing the fermenter before it is used again. A recording flowmeter is used on the sterilizing system to assure the proper amounts of steam in cleaning. Temperature recorders on the fermenters provide an accurate record of each sterilizing job.

Our still house has five distilling

units. Three of them are relatively simple one-column stills performing single operations, such as spirits recovery from heads and tails drawn off in the other stills; vacuum distillation of gin; and water distillation. The whiskey still is a two-column unit—a beer column and a rectifying column. The spirits still is the largest unit. It has four columns—beer, purifying, rectifying, and fusel oil.

A detailed description of our instrumentation for each of these units would be needlessly long. On the board, where all the instrument-gathered facts are concentrated for convenience of control, the instrumentation consists of telltales, rotameters, recording and indicating instruments and hydrometer testers.

Smooth Operation

The reason for having the assorted controls and instruments is to obtain smooth, uninterrupted operations. This is particularly true of the automatic controls operated by instruments. Let us examine a few of the manufacturing operations to see how the instruments are used to control quality and to keep equipment maintenance at a high level. The tendency of the human operator's judgment is overcontrol. When a temperature must be reduced, he tends to turn the steam too low or the cooling water too high. Then, as the temperature swings past the desired level, he tends once more to overcontrol, bringing it again too high. An instrument that is properly selected, installed, and set, controls with greater moderation.

Consider the four-column spirits still, which is our most intricate piece of distillation equipment. The function of the beer column is to strip off the spirits from the fermented mash. The purifying column removes the impurities classified as heads, fusel oil, and esters. In the rectifying column, more fusel oil is removed near the base, a heads product is taken from the top, and the finished spirits is removed near the top of the column. The impurities that have been separated in the preceding processes are run into the fusel oil column, where they are concentrated for disposal.

Whatever the function of a given column, the pattern of operations and of control is essentially the same as in the others. In each column we are controlling internal pressures, we are controlling the cooling water to give constant temperatures, and we are recording the temperatures at different levels (usually top, middle, and bottom of the column) to show us that this operation is maintaining constant conditions.

In the beer column, automatic controls regulate the flow of the incoming material, the beer. Also this column operates at an absolute pressure of 32 mm. of mercury. This vacuum is induced by a two-stage barometric ejector, and a controller on this vacuum keeps the pressure constant. The column has an automatic control on the steam flow, and there is another on the temperature in the condenser, which is maintained by a thermostatic control on the flow of cooling water.

To aid in cooling the condensate to reduce the vapor loss of spirits the proof of the product is reduced by the direct addition of water in the beer condenser. A hand-controlled rotameter regulates the flow of water in this condenser. Rotameters on the panel board regulate the following: Dilution water; spray water in the top of the column; dilute alcohol (taken out and returned in quantities to hold an even proof—or strength of solution—throughout the system); purely as a measurement rather than a control, the flow of product from the beer column—which equals, of course, the feed of material to the purifying column.

To maintain constant temperatures throughout the different levels of the column, a temperature recorder is used. It has three pens, one each for the top, middle, and bottom of the column. If something happens to the vacuum, or if the steam flows varies, these temperatures will vary, the lines will not coincide as they should, and, immediately, the two operators, who continuously watch the instrument board, will either make the required correction or get in touch with the supervisor.

Types of Instruments Used by Calvert

32 pump and agitator telltales, each with a start button and a stop button

30 rotameters

44 recording instruments

11 indicating instruments, including a clock

14 hydrometer testers

Regulates Water

An automatic temperature controller regulates the flow of water through the condenser in the beer column. This control keeps the pressure constant, which enables, in turn, a better separation of heads from the column, and which gives other operating advantages. The column is equipped with a pressure control that holds 80 inches of water in pressure at the base of the column. This pressure, controlled from the instrument board, enables the operators to keep the draws constant by means of valves and rotameters.

The whiskey still has controls that are much the same as those in the spirits still. Steam, cooling water, pressures, and temperatures are recorded and controlled, either automatically or manually. In the whiskey still we also control constant draw with a rotameter. There is, as it happens, a direct relationship between proof and temperature. Thus our control of the operating conditions inside the still gives a constant proof in the products derived from the still.

The huge board reveals a wealth of information on other operating conditions not directly connected with what goes on inside the stills. For instance, there are pressure gages showing all the pipe mains that bring water, steam, and air. There are three steam mains—150, 90, and 12 pounds. On the main that carries the re-used well water that has been used for cooling in one condenser, the instrument board shows both pressure and temperature. Because the board controls all valves by air pressure, its maintenance is essential; and if this pressure should fail, our entire instrumental and automatic control would thereby be cut off.

Hydrometer testers are set in lines on the board. By using them, the operators can tell the proof of all liquids at various stages in the process.

In summary, let us say that all deviations from normal are immediately recorded by the various instruments comprising our control board; thus the operator is enabled to hold the process at optimum conditions at all times. Quality is guaranteed by scientifically controlled operations throughout the process.

Lighting to Stop Sabotage

No need to waste time in experiments, because fundamentals in the application of protective lighting and other measures have been worked out

DAVIS H. TUCK, Electrical Engineer, Holophane Company, Inc., New York

A curtain of light forms a barrier that cannot be penetrated without detection. Lighting units on this building have 300-watt lamps and are mounted 22½ feet high, spaced 70 feet apart

PROTECTIVE LIGHTING is only one element, although a most important one, in the chain of defenses that must be erected around industrial plants. For maximum effectiveness these defensive measures must be properly coordinated.

Protecting a plant against sabotage and espionage requires:

1. Erection of a 7-ft. fence entirely around the plant.

2. Guardhouses located so that watchmen can see all parts of the fence line and the area in front of and inside the fence.

3. Each guardhouse should be provided with a telephone to the captain of the guard and a 1,000-watt concentrated-beam, adjustable searchlight with switch for turning on and off.

4. Guards must be instructed not to leave their posts under any circumstances until relieved.

5. It is desirable that guards be equipped with a suitable firearm.

6. Erection of poles around the property 150 feet apart and 4 feet inside the fence line.

7. Installation of a suitable lighting unit on each pole at a height of 25 feet above the ground. These units should be mounted on a 4-ft. bracket, so that they will be directly over the fence line. Use of a 6,000-lumen, 6.6-amp. series lamp is recommended. The resultant illumination along the fence will be about 0.15 foot-candles (six times full moonlight). The space outside and inside the fence will also be lighted adequately.

Guards are to be instructed to call the captain of the guard on the telephone, if they see or hear anything of a suspicious nature, and turn on their searchlights if necessary to intensify the illumination. The captain of the guard will then send out an armed patrol to investigate the trouble. If in the meantime an intruder gets over the fence he can be taken care of in the 100 feet or so of lighted space inside the fence, before he reaches darkness and safety.

A variation of this method of lighting and the functioning of the men is to station the primary guard in the customary guardhouse and have a secondary guard patrol the fence in an automobile along a road located about 50 feet inside the fence. There is apparently an advantage in keeping the patrol car in the dark, and for this reason the refractors used give a 180-deg. distribution of light instead of a modified 360-deg. distribution. The lamp size, spacing, mounting height, and other details of the installation remain the same as already described.

Since it is essential that the protective lighting function with the utmost reliability, the layout of its distribution system is worthy of careful consideration. There are several methods of wiring that have been used successfully. Among them are:

1. A regular multiple system using multiple lamps and a 115- or 115/230-

Essential to Protection

1. **A high fence around the plant property**
2. **Well-trained, armed guards**
3. **Adequate lighting of the fence, important structures, and strategic factory areas**

volt distribution. Such a system is very simple but has the disadvantage that with long runs the voltage drop becomes so great that illumination suffers. It should be remembered that 1 percent drop in voltage means 3 percent drop in illumination. The multiple system is not used for fence lighting except for small jobs such as substations and wells. Figure 1 shows a typical wiring diagram for such a system.

2. Where the fence line is long, it is common practice to use the same system of distribution that has been employed so successfully for street and highway lighting. It is the series system (Figure 2), consisting of a constant-current transformer and a one-wire loop around the fence, the lamps being all connected in series. A film cutout is placed in each lamp socket so that if a lamp fails in service the film is punctured by the high voltage of the open circuit and the defective lamp is shorted. The current carried in such a circuit is only 6.6 amperes regardless of the number of lamps on the circuit, and because of the regulation of the constant-current transformer the lamps always operate at rated voltage. Another advantage of this system is that the rated life of series lamps is 2,000 hours.

This system of distribution is in common use now, although another system described under 4 is making headway because of its simplicity and low cost.

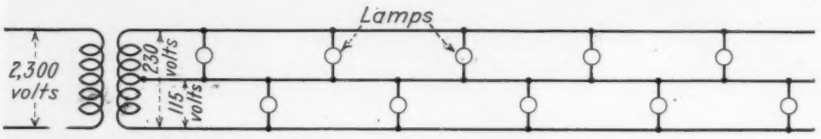


Figure 1. The regular multiple system is simple, but on long runs the voltage drop may be excessive

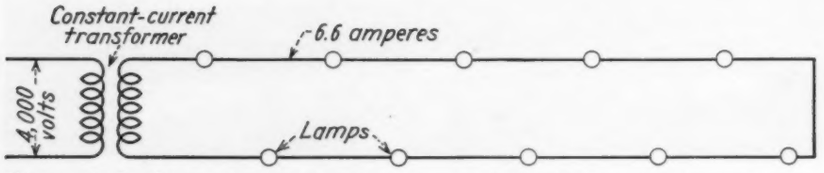


Figure 2. In the series system lamps are connected in series and supplied from a constant-current transformer through a one-wire loop

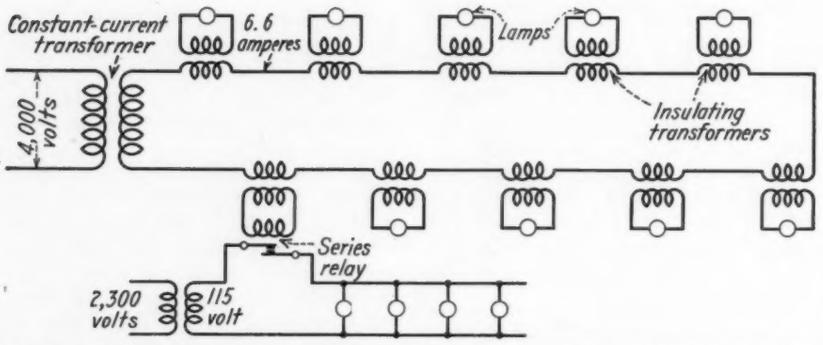


Figure 3. High voltage of the series circuit can be kept from the lighting units by providing each one with a small insulating transformer whose primary is in series with the line

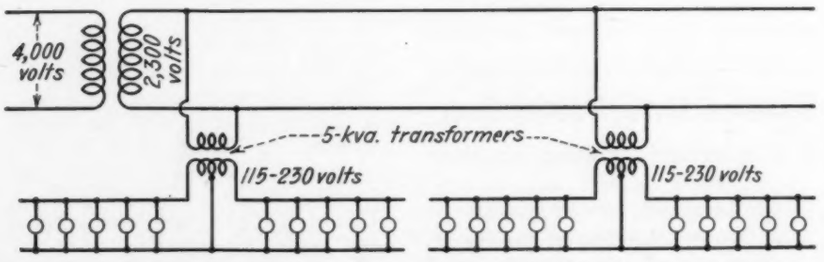


Figure 4. Here the lighting units are supplied in small groups by 5-kva. transformers fed from a 2,300-volt line

3. Another type of series system is also in use to a limited extent. From many standpoints it is better than the regular 6.6-amp. series system but it costs more to install. Often it is combined with the latter system.

This system consists of a regular 6.6-amp. series system but instead of having the lamp in series, the primary of a small insulating transformer is in series in the circuit, and the lamp operates off the secondary of this transformer. With this method the high voltage of the series circuit is isolated from the lighting unit and 6.6-, 15-, or 20-amp. series lamps or ordinary multiple 115-volt lamps can be used.

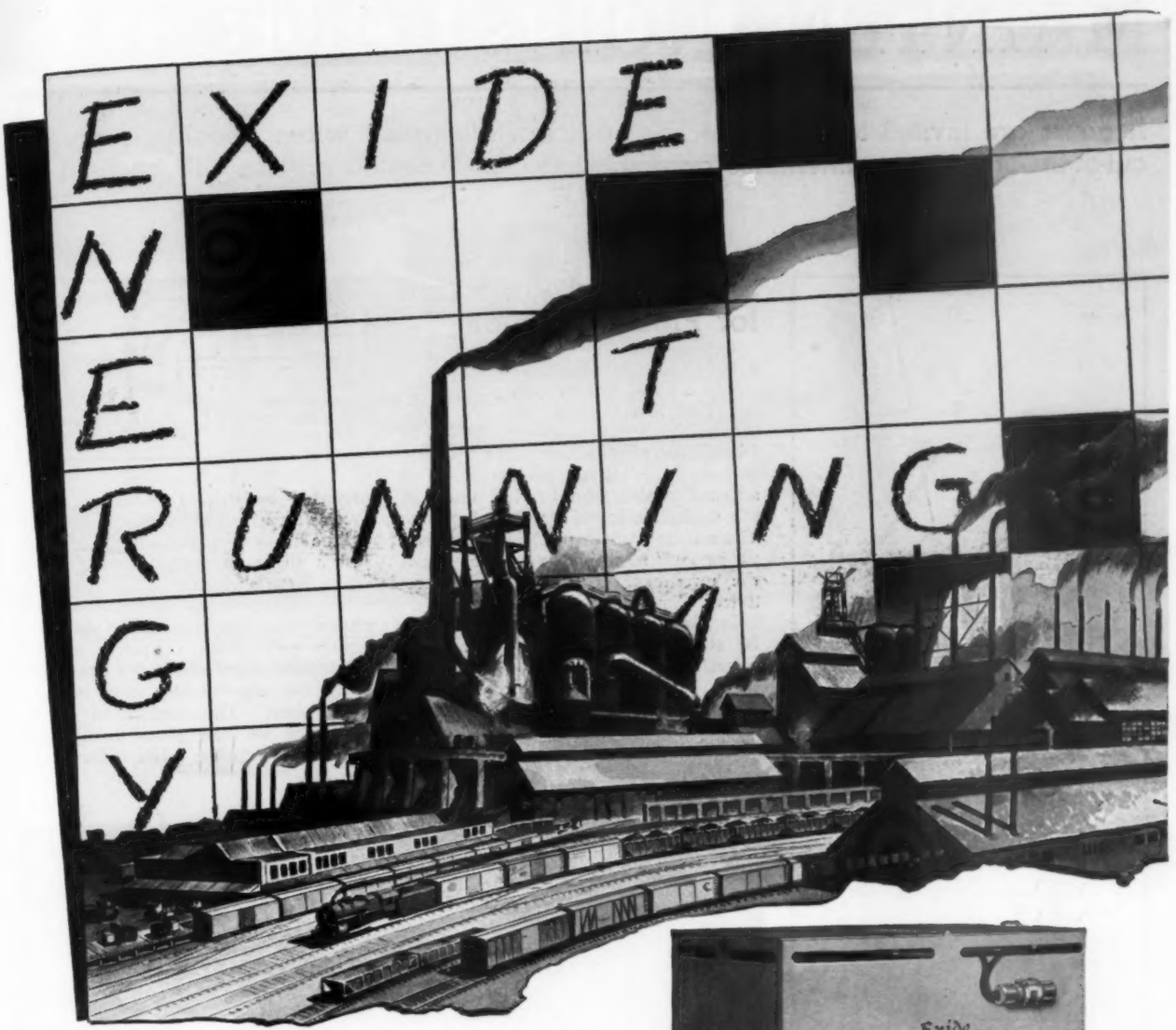
These transformers are also often used to close or open other circuits about the plant. For example, a bank of floodlights used for lighting a parking space can be turned on and off by the regular protective lighting system although they are operated from a separate 230/115-volt transformer.

Figure 3 shows a variation of the series circuit with insulating transformers and series relays.

4. A modification of the regular multiple system that is gaining in favor because of its simplicity and low cost, involves running 2,300 volts along the fence pole line and locating 5-kva. 2,300/230/115-volt transformers on poles to supply a group of lamps on each side of the transformer. Thus, when lighting units are spaced on 150-ft. centers and 300-watt multiple lamps are used, eight on each side of the transformer, a total distance of 2,400 feet—almost one-half mile—is lighted from one 5-kva. transformer. Number 10 wire is used in the secondary circuit for a maximum voltage drop of 5 percent.

Figure 4 shows a typical wiring diagram of this modified multiple system.

The overhead system of distribution for protective lighting has been used for the new powder and loading plants, while underground distribution has been used for airports and air depots. It is the opinion of experienced engineers that overhead distribution is less subject to trouble from explosives than are underground systems, and repairs can be made more quickly.



Exide is a five-letter word for DEPENDABILITY

THAT is the answer if you ask the men in thousands of factories who are responsible for speedy handling of materials and freight . . . the men whose electric industrial trucks are equipped with *dependable* Exide-Ironclad Batteries.

These busy days, your handling of stores, materials and freight must be maintained at top speed . . . your electric trucks probably have to handle *heavier* loads *faster* . . . and they must keep going without service interruptions, tie-ups or delays.

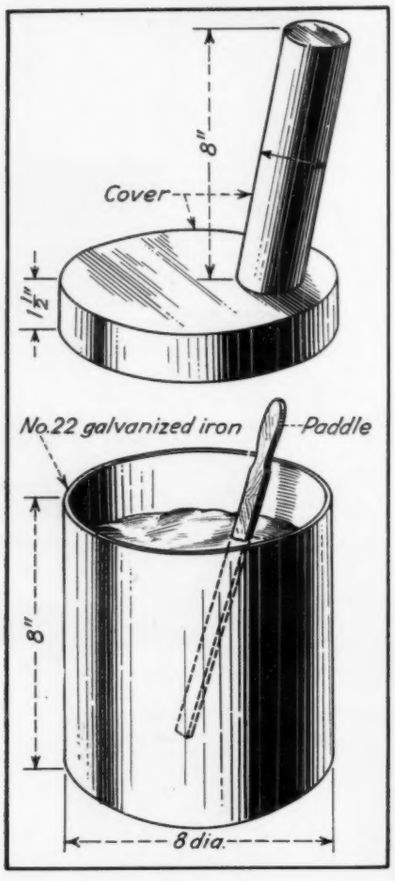
That's why Exide today is a five-letter word with a big meaning . . . *dependability* . . . as Exide Batteries, maintained efficiently by the Exide System, work the clock around in factories from coast to coast . . . to help defense industries produce more . . . to keep America rolling!

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for



Special Can Keeps Grease Clean

W. H. BANTHIN, Crivitz, Wis.

A solution to the problem of contamination of bulk grease was presented in the recent inspection of methods at a rehabilitated sawmill. A portion of the equipment had been modernized with fittings for gun-type lubrication, but a considerable number of cups and greased slideways still remained. Therefore it was desirable to keep small quantities of grease at various points in the mill near the units calling for periodic greasing. However, there was always the danger of contamination when open grease cans, dirty paddles, or partially open cans with protruding paddles were used.

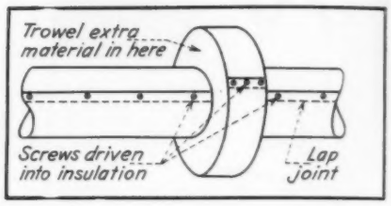
In the attached sketch is a grease can fabricated by a local tinsmith for less than $2 a unit. The cover is constructed so that the paddle can always be left in the can after use. Thus, both paddle and grease are protected from contamination.

Sheet Metal Protection for Pipe Insulation

E. F. SIBLEY, Chief Power Plant Engineer, Seamless Rubber Company, Inc., New Haven, Conn.

Installation of pipe insulation, particularly on large fittings and flanges, is an art, and anyone who has had much of this work done knows that it costs plenty. There is no question that insulation is a paying investment but in too many cases the investment is not sufficiently protected. Something more is needed.

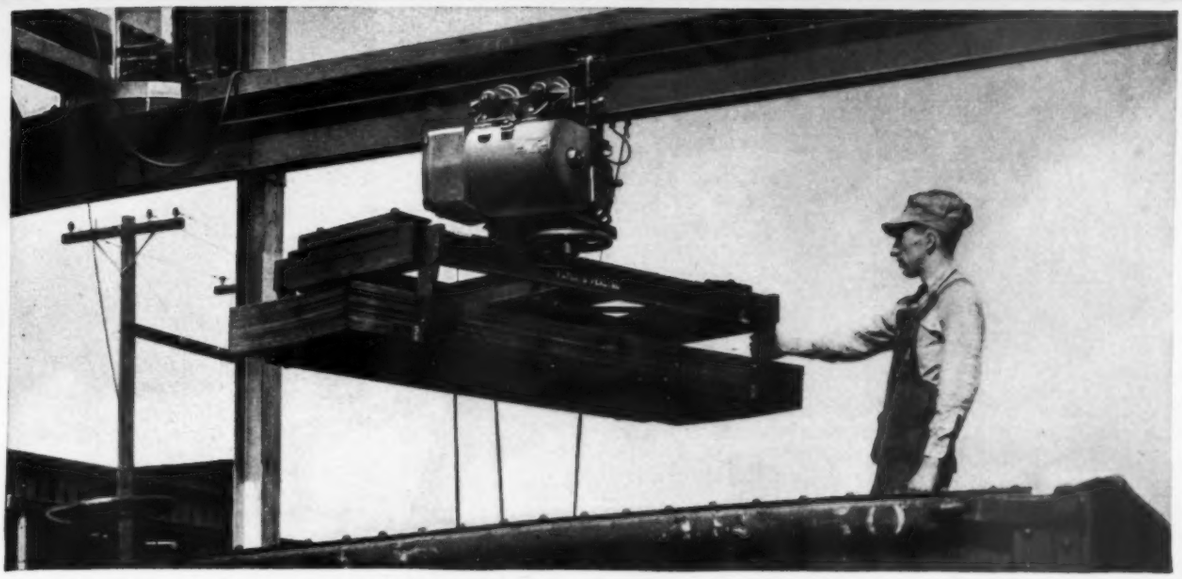
In places where insulation is likely to be climbed or walked on in reaching valves, or damaged in other ways, sheet metal protection pays well. We use 26-gage galvanized iron cut to allow ¾ to 1-in. lap. The outside edge is formed to the curvature of the insulation to be protected by striking the edge of the sheet with a wooden mallet as the edge of the sheet lays on a piece of pipe. Just a slight curvature is given to the edge of the sheet.



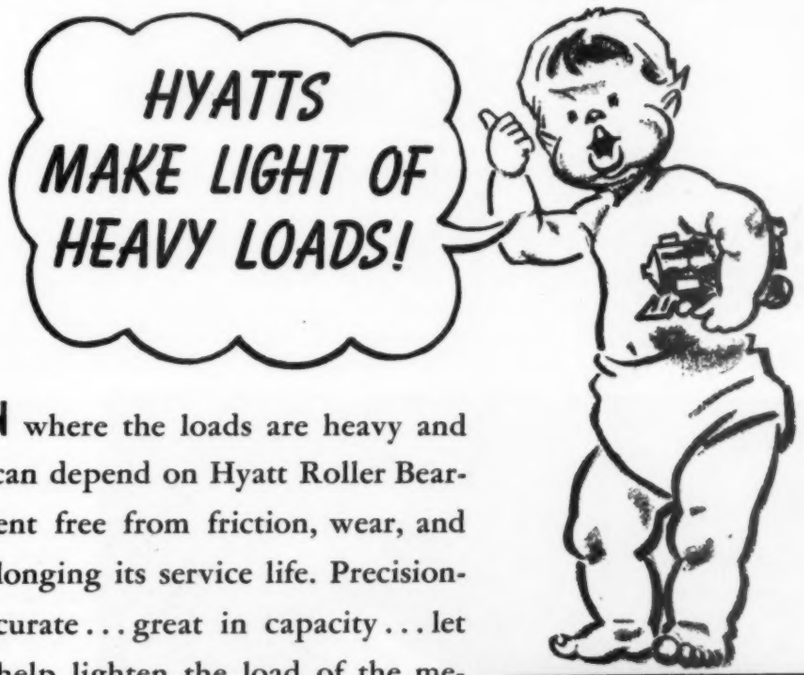
The sheet metal is then wrapped around the insulation and pulled up tightly with straps or pieces of rope. Small sheet metal screws are then driven along the edge of the seam to secure it in place. This method of securing the metal we have found to be better than angle bending. Holes for starting

Portable fluorescent lighting units in the generator rotor winding section of the East Pittburgh Works of the Westinghouse Electric & Manufacturing Company. Mounted on portable pipe stands that permit a height adjustment, four 48-inch twin-lamp fluorescent fixtures, 40 watts each, supply 20 to 25 foot-candles over a considerable area in the workplane

KEEP THEM YOUNG WITH HYATTS



R & M Hoists built by ROBBINS & MYERS, INC., Springfield, Ohio and fully equipped with Hyatt Roller Bearings help you to handle materials easier, faster and more economically.



IN EVERY APPLICATION where the loads are heavy and the going tough you can depend on Hyatt Roller Bearings to keep equipment free from friction, wear, and attention . . . while prolonging its service life. Precision-built . . . incredibly accurate . . . great in capacity . . . let these better bearings help lighten the load of the mechanical equipment you build or buy. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, New Jersey; Chicago, Pittsburgh, Detroit, San Francisco.

HYATT

ROLLER BEARINGS

QUIET

screws can be either drilled or punched. We use a small electric drill.

Flanges whose insulation is in bad shape can be protected and then patched by troweling additional insulation into the vacant places. Old magnesia covering broken up and mixed with water makes an excellent patching cement.

•

National colors ride on steel. Special routing cards printed in red, white, and blue are used by one company to identify steel defense orders on their way through the plant from rolling to shipping.

•

Press Repaired by Welding

SOURCE: The Lincoln Electric Company, Cleveland

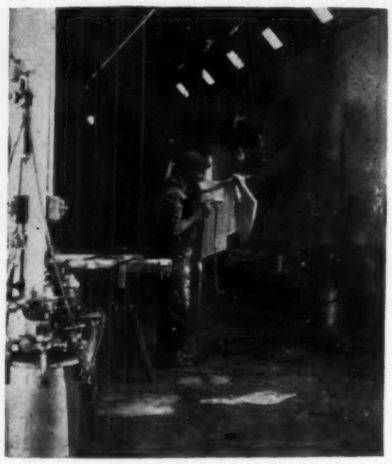
A repair job was necessitated by an inexperienced operator overloading a press by putting two pieces in the die, with the result that it broke the pitman arm. Inquiry for replacement of this 20-year old part disclosed that the manufacturer could not locate the original pattern. However, the maintenance department cut tubing and small rectangular sections which were fused together as shown in the photo. Approximately 2½ days were required for welded repair.

To replace broken 20-year-old part, maintenance department cut and welded new sections. Only 2½ days were required to repair press

Gets Better Lighting, No Explosion Hazard

SOURCE: Holophane Company, Inc., New York

Recently the problem arose of providing safe illumination for spray booths used in painting airplane wings. These booths measure 35 and 40 feet from entrance to water wash at back. Solvents used are



explosive and air moves toward the back of the booth at the rate of 100 feet per minute. Lights and wiring had to be kept from contact with explosive vapors.

Formerly, the light was introduced through wire-glass windows from vapor-proof fixtures located outside the booths. Fourteen 200-watt units in the 35-ft.

booth gave 10 foot-candles on the plane wings. However, there was too much glass. It absorbed part of the light and maintenance was not easy.

Now, the same type of booth and the 200-watt lamps are still used. A new style prismatic reflector has been installed in each window to provide illumination of vertical wing surfaces. Each box unit contains one 200-watt lamp and a reflector. Running into each box is an air line which introduces air at about 1 pound pressure—sufficient to keep paint vapors from coming into contact with the lights.

The lights are interlocked with the air compressor so that when there is no air, there is no light. A mercury switch turns off the light when the inclosing box cover is lifted. With this installation (total cost was about $30 per light) danger of explosion was eliminated and better lighting obtained—37 foot-candles as compared with 10 for the old system.

•

Time-Study Table Eases Time-Study Man's Job

JOSEPH BABEOR, Passaic, N. J.

An analysis of the work that the time-study engineer does shows that he must stand in one spot or place for hours at a time. Ordinarily, he must hold the time-study board and watch in his left arm and hand, and record the observations with his right.

This position is very tiresome if held over a long period of time. To remedy this fatiguing condition, a small table on wheels has been used with success. The table is about 42 inches high and 24 inches square.

When in use, the table is wheeled to the desired location and the time-study board placed on it, while the engineer makes his preliminary investigation. In taking the time study, a stopwatch held loosely in his hand permits the engineer to leave his board for a minute or two without having to carry it with him.

The table may be used for other purposes. Several of these portable work desks may be of great help in taking inventory and in other clerical jobs.

UNSAFE TURNS *plus* EXTRA STRAIN WILL WRECK YOUR *Pipe Lines* TOO . . .

THE DANGER LIES AT THE **TURNS**

Hurtling power and a weak curve played havoc with this express train. Another failure at the turns. (*Acme photo*).

Weld your piping with TUBE-TURN fittings for stronger, safer, trouble-free, "turns"

Many railroad disasters happen AT A CURVE—because that's where strain and wear hit hardest.

Piping systems face the same hazards. Pressure, friction, stress, and erosion punish your lines worst *at the turns*—wherever there is a change in direction.

That's why it is sound engineering to insure the *utmost* safety and strength at these danger points with TUBE-TURN Welding Fittings.

Welding with Tube-Turns gives your plant the assurance and economy of piping systems with longer life, better performance, space-saving layouts and virtually no maintenance interruptions.

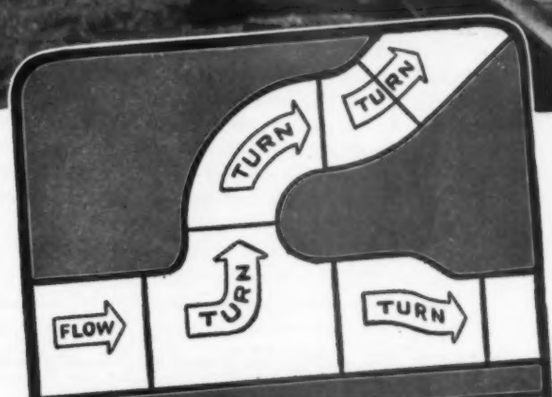
Write for helpful Tube-Turns engineering data book and catalog.

TUBE-TURNS, Inc., Louisville, Ky. *Branch offices:* New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Tulsa, Los Angeles. Distributors everywhere.

TUBE-TURN

TRADE MARK

Welding ★ The ★ FIRST WELDING FITTINGS 1ST AND STILL THE BEST *Fittings*



As indicated in the drawing above, there are vital "turns" in piping other than at elbows and returns. Tees, reducers, laterals, and nipples likewise entail abrupt changes in flow direction that result in *added* strain, friction and wear at these connections. The built-in strength of *all* Tube-Turn welding fittings gives unequalled reinforcement for *each* of these *danger spots.*

Direct-Current Control Circuits

OREN G. RUTEMILLER, Westinghouse Electric & Manufacturing Company, Detroit

EASE IN SHOOTING TROUBLE on d.c. controls depends largely on a clear understanding of the basic principles and circuits used. It is the purpose of these data sheets to give that information.

In general, d.c. motors of less than 2-hp. rating can be started across the line, but with larger motors it is usually necessary to put resistance in series with the armature when it is connected to the line. This resistance, which reduces the initial starting current to a point where the motor can commutate successfully, is shorted out in steps as the motor comes up to speed and the countervoltage generated is sufficient to limit the current peaks to a suitable value. Accelerating contactors that short out successive steps of starting resistance may be controlled by countervoltage or by definite-time relays.

For small motors used on auxiliary devices the counter-e.m.f. starter is satisfactory. The definite time starter is more widely used, however, and has the advantage of being independent of load conditions.

The following diagrams illustrate some of the circuits commonly used for d.c. motor control.

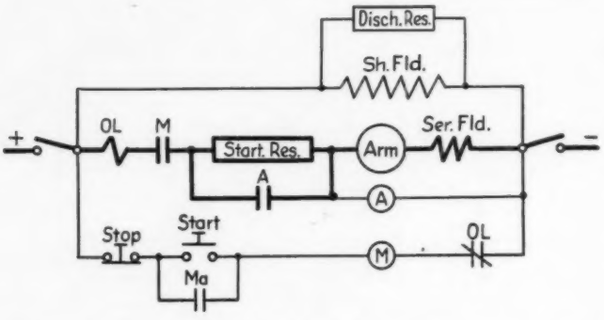


Figure 1. Basic requirements of a non-reversing d.c. starter in its simplest form.

When the start pushbutton is depressed line contactor *M* closes, energizing the motor armature through the starting resistance. As the motor comes up to speed the countervoltage, and the voltage across motor armature and series field, increases. At a predetermined value the accelerating contactor *A* closes, shorting out the starting resistance.

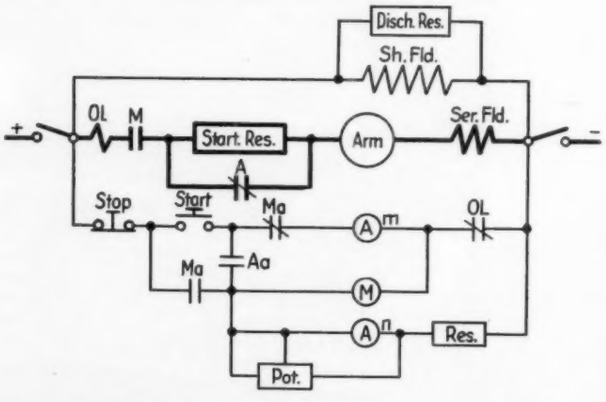


Figure 2. Typical, non-reversing constant-speed, definite-time starter. The accelerating contactor is equipped with a time-delay mechanism. This contactor, *A*, is of the magnetic-flux-decay type. It is spring-closed, equipped with two coils, and has a magnetic circuit that retains enough magnetism to hold the contactor armature closed and the contact open indefinitely. Main coil *Am* has sufficient pull to pick up the armature and produce permanent magnetization. Neutralizing coil *An* is connected for polarity opposite to the main coil. It is not strong enough to affect the pick-up or holding ability of the main coil but, when the latter is deenergized, the neutralizing coil will buck the residual magnetism so that the contactor armature is released by the spring and the contacts close. By adjusting the potentiometer the voltage impressed on this coil and hence the time required for the contactor to drop out can be varied. When the start button is depressed accelerating contactor coil *Am* is energized, causing contact *A* to open and auxiliary contact *Aa* to close. Contact *Aa* energizes line contactor *M*, and normally open auxiliary contacts *Ma* establish a holding circuit. Neutralizing coil *An* is also energized. Opening of contact *Ma* deenergizes coil *Am* and contactor *A* starts timing. At the set time the main normally closed contacts on *A* close, shorting out the starting resistance and putting the motor across the line.

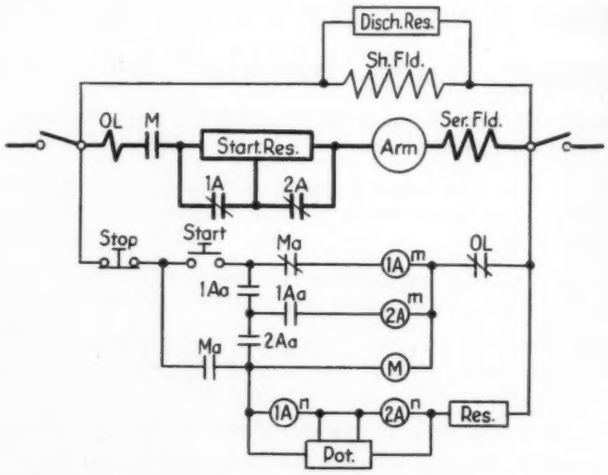


Figure 3. The same kind of a starter as in Figure 2 but designed for use with a motor of larger horsepower.

This starter provides two steps of definite-time starting. The operation is essentially the same as in Figure 2 but the first accelerating contactor, *1A*, does not short out all the starting resistance. It also starts *2A* timing, which finally

(Continued on page 104)

His illness costs your business a week's pay roll each year . . . costs America the time to build 52 battleships

ILLNESS costs the work of *a million men every day*, it is estimated from a U. S. Public Health Service report. Numerous other studies show that over *half* of this loss is due to colds and their complications.

In firms which established health programs, absences were reduced an average of 29.7%, according to the N. A. M. Industrial Health Practices survey. In an effective health program, individual towels, hot water and soap help prevent the spread of common contagions.

Over 50% more workers now enjoy the health protection of "Soft-Tuff" ScotTissue Towels, based on increased shipments in 1941. When wet, these improved towels have 10 times more rub strength than previous ScotTissue Towels. Yet they are soft as ever. Since one towel does a complete drying job, costs are reduced.

* * *

Call on the Scott ***Washroom Advisory Service*** for expert help in improving washroom hygiene, comfort and economy.

Copyright, 1941, Scott Paper Co., Chester, Pa. Trade Marks "ScotTissue," "Soft-Tuff" Reg. U. S. Pat. Off. Trade Mark "Washroom Advisory Service" Registration applied for.

STAY TOUGH WHEN WET

INDIVIDUAL... SANITARY

Soft-Tuff

ScotTissue TOWELS

Direct-Current Control Circuits *(Continued from page 102)*

shorts out the remaining resistance. The normally open auxiliary contacts on the accelerating contactors in Figures 2 and 3 are arranged so that it is necessary for the accelerators to pick up before the line contactor can be energized. This is a safety interlocking scheme that prevents starting the motor across the line, if the accelerating contactors are not functioning properly.

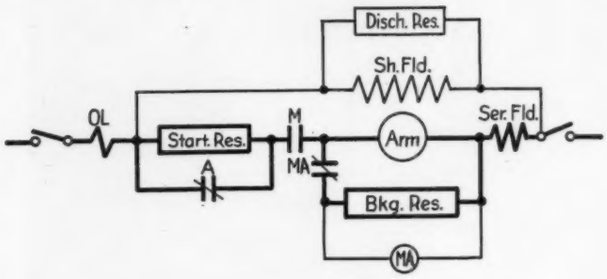


Figure 4. One way of producing dynamic braking.

Control circuits have been omitted, since they are a duplicate of those shown in Figures 2 and 3. Line contactor *M* has two poles, one normally open and the other normally closed. Both poles are equipped with an operating coil and are on the same armature, which is hinged between the contacts. In starting, when line contactor *M* closes normally closed contact *MA* opens. When the stop button is depressed the line contactor drops out and contact *MA* closes. The motor, now acting as a generator, is connected to the braking resistor and coil *MA* is energized by the resultant voltage. It causes *M* to seal in tightly, establishing good contact pressure and preventing this contact from bouncing open.

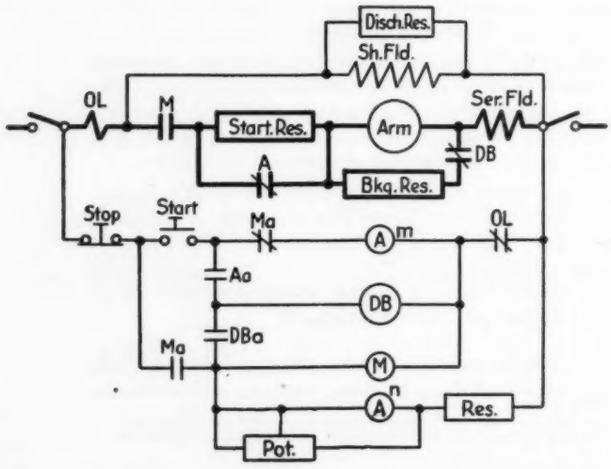


Figure 5. In the more modern types of controllers a separate spring-closed contactor is used for dynamic braking.

Operation is similar to that described for Figure 2, except that the energizing of coil *Am* and the picking up of accelerating contactor *A*, closing contact *Aa*, energizes dynamic braking contactor *DB*, which in turn energizes line contactor *M* through its auxiliary contact, *DBa*. This arrangement not only insures that the dynamic braking contactor is open, but also that it is open before the line contactor can close. In order to obtain accurate inching, such as is required for most machine tool drives, the motor must respond instantly to the operation of the pushbutton. In the scheme shown in Figure 5 the closing of the line contactor is delayed until the accelerating contactor and the dynamic braking contactor pick up.

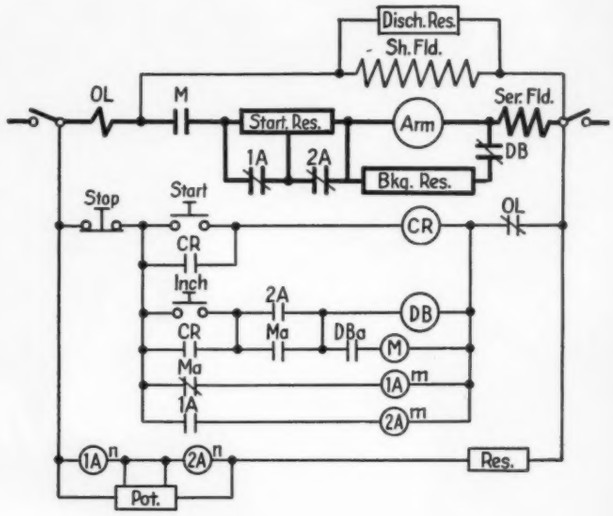


Figure 6. Arrangement to secure quicker response of motor, for more accurate inching.

Accelerating contactors *1A* and *2A* are energized in the off position. Hence, when the start button is depressed, the dynamic braking contactor picks up immediately and its auxiliary contact *DBa* picks up *M* line contactor.

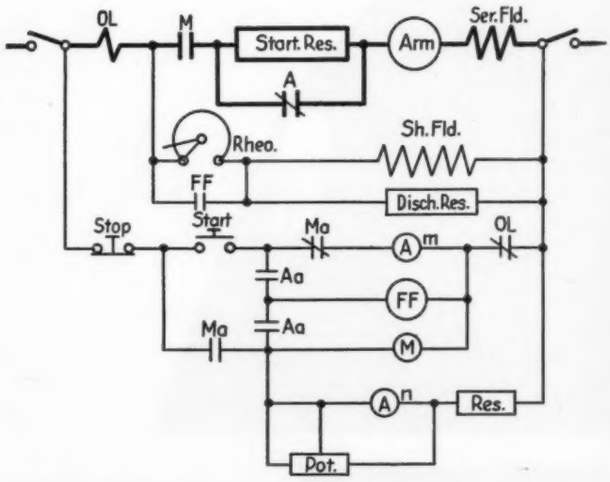


Figure 7. One method of connecting full field relay, used with adjustable-speed motors having a speed range in excess of 2 to 1. Coil *FF* is energized by the closing of the normally open auxiliary contact *Aa* and remains closed until the last accelerating contactor drops out. Contacts of the full field relay, *FF*, are connected to short out the field rheostat thereby applying maximum field strength to the motor during the starting period. *(To be continued)*

Keeping men at work
The safety of "A.W." Rolled Steel Floor Plate has real meaning in defense plants. Saves man hours by minimizing costly slipping and falling accidents. Here is the one safe floor for every industrial use. There are no worn and slippery surfaces to endanger men on foot. No cracks or ridges to upset floor trucks. Oil-proof, heat-proof, fire-proof, crack-proof. Easy to clean, quick to drain. Made in five patterns. The Super-Diamond Pattern is shown here. Write for illustrated folder.
"A.W." Rolled Steel
FLOOR PLATE
ALAN WOOD STEEL CO., CONSHOHOCKEN, PA.
District Offices and Representatives—Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, New Orleans, Pittsburgh, Roanoke, Sanford, N.C., St. Paul, St. Louis, Los Angeles, San Francisco, Seattle, Montreal.

3 ways TO GET THROUGH A DOOR

One of them will save you time and money

1. SMASH-UP!

This costs money. In fact, cost studies show hundreds of dollars *per year* wasted in this way for repairs to doors, frames and hinges on a busy truck route.

2. STOP & GO!

This wastes time. How many minutes per day do you lose in your plant at "on-and-off" doorways? And what happens to temperature and humidity control when doors are left open?

3. Full Speed Ahead with "ELECTRIC EYE" Door Control

"The Phantom Doorman" permits driving industrial trucks and trailers through hinged doors without damage or delay. *It pays for itself* by saving repair bills, preventing heat loss, keeping air-conditioning up to par.

"Full-Time" Door Control to Fit Your Present Requirements

"The Phantom Doorman" may be controlled by electric eye, ceiling or wall type switch, or floor treadle. Existing compressed air system may be used for power. *But even when the air supply is off, doors are still under control. "The Phantom Doorman" allows the doors to be opened manually and closed automatically just as any door equipped with a conventional door closer.*

Write today for cost-cutting facts. Address "The Phantom Doorman," Dept. 24, The Yale & Towne Mfg. Co., Stamford, Connecticut.

Local distributor-engineers in most large cities.

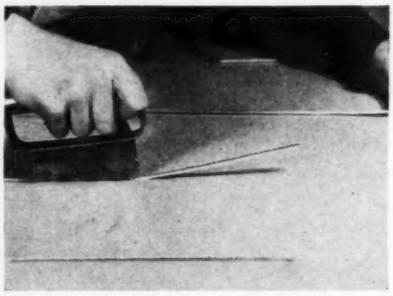
"THE PHANTOM DOORMAN"
ELECTRIC EYE CONTROLLED
DOOR OPENER
DOOR CLOSER
Makers of the famous Yale line of Locks, Hardware, Pumps, Hoists and Industrial Trucks
TRADE YALE MARK

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• WATERPROOFING COMPOUND, claimed to be an effective seal for concrete, brick, stone, and other masonry, wood and composition materials, can also be used as a protective coating for metals. It is a clear rubber-base liquid, which, when sprayed or brushed on, penetrates the pores and is said not to crack or peel off. Primoid Products Corp., 103 Park Ave., New York.



TIME-AND-COST-SAVING method of attaching fabric to control surfaces of airplanes (investigations indicate applications in other fields) uses a special tool which forces thin retainer strips into extrusions in the rib construction. Holds fabric covering tightly in place but without danger of tearing, it is said. Bell Aircraft Corp., 2050 Elmwood Ave., Buffalo

• SPRING-LIKE COILS of translucent Tenite plastic fitted over standard fluorescent tubes are said to correct color and remove glare. They are available in almost any color or combination of colors. Schwab & Frank, Inc., Detroit.

• IF YOU YEARN AFTER an easy method of selecting carbide-tool shank and tip sizes, you will welcome two charts—one that helps you determine shank sizes and another for tip thicknesses. Carboloy Co., Inc., Detroit.

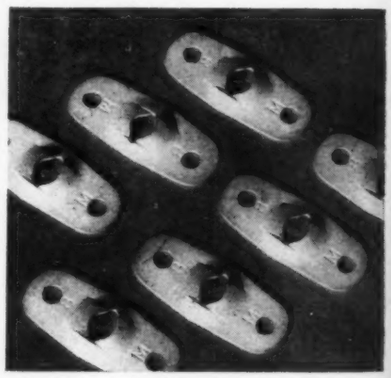
• LOW-COST METHOD of electroplating steel products with zinc utilizes cheap sources of this metal instead of anodes and produces zinc coatings on wire or strip said to be the equal of that produced by other methods. The zinc used is recovered from galvanizers' skimmings, brass foundry fume, organic reduction residues, or ore by a solution of ammonium chloride and ammonia. The Hanson-Van Winkle-Munning Co., Matawan, N. J.

• FOR THOSE APPLICATIONS where oil, grease, and other solvents deteriorate rubber rapidly a synthetic sponge rubber has been developed. Made from Ameripol, it has practically the same resilience as natural rubber sponge plus ability to withstand higher temperatures, it is said. The B. F. Goodrich Co., Akron.

• "WHAT'S NEW in lighting" is the theme of a house organ for the electrical trade. It contains news, promotional items, and technical data on both incandescent and fluorescent lighting. First issue was launched in September. Hygrade Sylvania Corp., Salem, Mass.

• HIGHLIGHTS, facts, and statistics on the activities of the Plomb Tool Co., 2208 Santa Fe Ave., Los Angeles, during 1940, and a summary of the estimated division of the 1941 income dollar are vividly yet simply set forth in a report to employees and stockholders.

• A "NO-BLINK" starter switch ends the life of a fluorescent lamp when the lamp reaches the blinking, burned-out stage and thus adds to the life of the starter. Interchangeable with present FS-4, two-contact switches for operating 40-watt Mazda F lamps. Westinghouse Electric & Mfg. Co., East Pittsburgh.

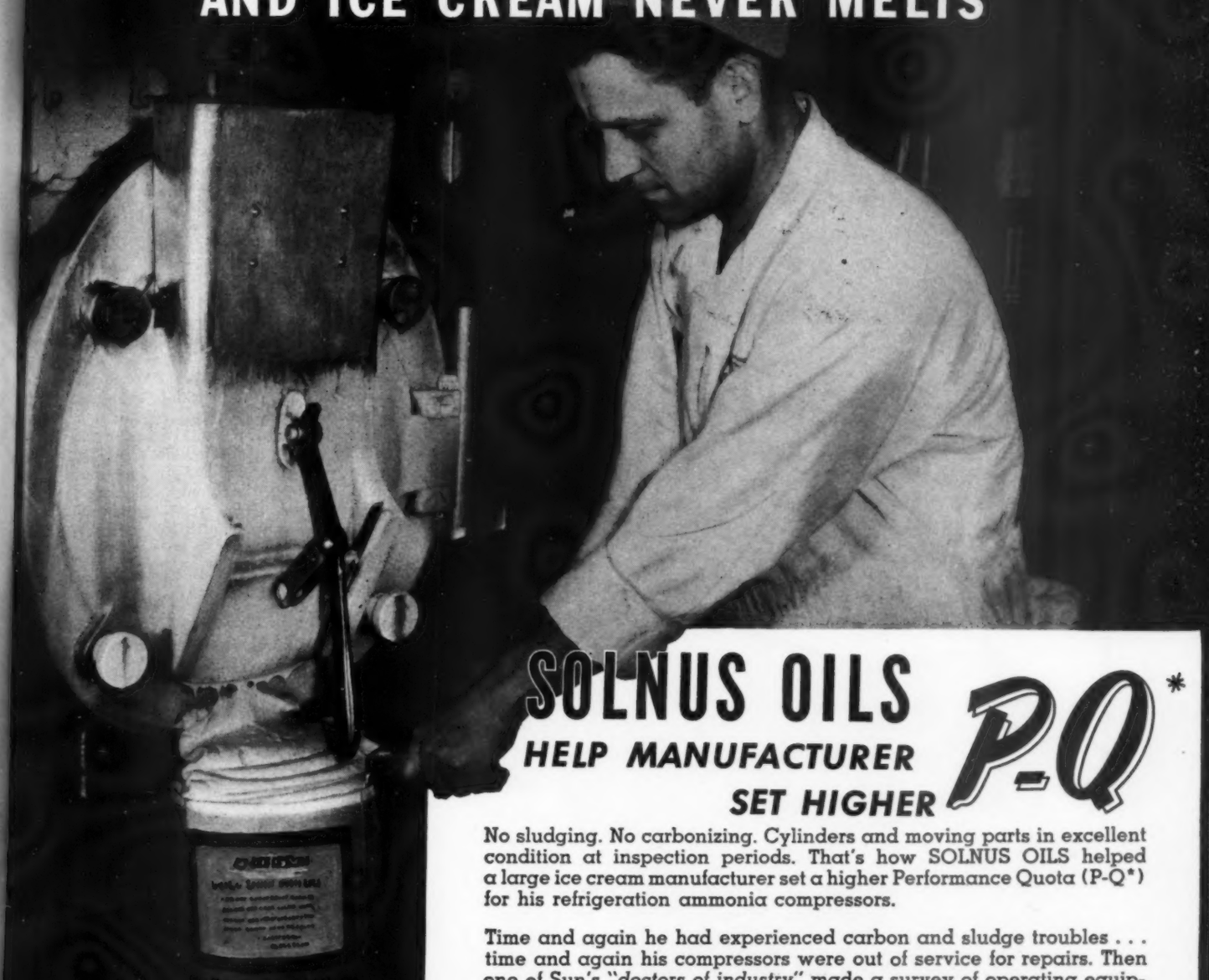


LIGHTWEIGHT anchor-type nuts of molybdenum aircraft spring steel are said to have set a new record in resistance to vibration loosening. Twenty percent lighter than the fastenings they replace, they are specially valuable in aircraft assembly. Tinnerman Products, Inc., 2055 Fulton Road, Cleveland

• RESISTANCE to hardening at extremely low temperatures is claimed for a new neoprene synthetic rubber which withstands effects of sub-zero temperatures better than other types of neoprene. Comes in pre-plasticized, milled sheets; specific gravity—1.15, lower than any other neoprene. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Compressors Get "CARBON CURE"...

AND ICE CREAM NEVER MELTS

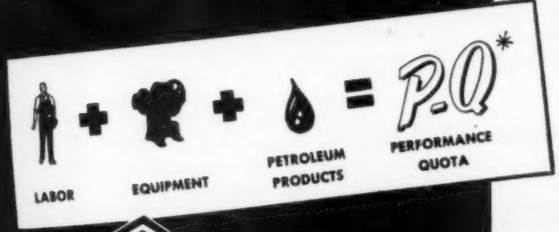


SOLNUS OILS HELP MANUFACTURER SET HIGHER P-Q*

No sludging. No carbonizing. Cylinders and moving parts in excellent condition at inspection periods. That's how SOLNUS OILS helped a large ice cream manufacturer set a higher Performance Quota (P-Q*) for his refrigeration ammonia compressors.

Time and again he had experienced carbon and sludge troubles . . . time and again his compressors were out of service for repairs. Then one of Sun's *"doctors of industry"* made a survey of operating equipment and conditions . . . recommended SOLNUS Oil Medium . . . and ice cream manufacture has been going on ever since without a second's difficulty due to lubrication.

If you have a problem lubricating refrigeration equipment operating under freezing conditions . . . or roll-neck bearings running at torrid temperatures . . . Sun's *"doctors of industry"* have the answer. Call them in today. Let them show you how Sun Industrial Lubricants can help you set a higher P-Q* for your plant equipment.



SUN OIL COMPANY · PHILADELPHIA

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

SUN OILS

Copyright 1941 by Sun Oil Company

PETROLEUM PRODUCTS FOR ALL INDUSTRIES

$1125 A Year Saved
On Finishing Costs
– Another Success Story
By AP "Grief Busters"!
AP GRIEF BUSTER No. 537
THE GRIEF
Manufacturer of machine screw chasers found that the 4"x36" belts used to get vitally accurate bevels were not giving consistently good results, and were producing only 180 units per belt.
GRIEF BUSTER
AP Engineer suggested the use of AP's exclusive new Silver Streak insulated belts. At the same cost per belt (25¢), an average production of 400 units was obtained. Belt purchases were cut from 8500 a year to 4000 a year.

The idea of an AP Engineer saved this manufacturer the price of 4500 belts annually – $1125. If you've got any kind of a finishing problem, AP "Grief Busters" may make a similar saving for you! Our big file of hundreds of "grief buster" cases shows that there are mighty few finishing operations that can't be improved – mighty few finishing problems that can't be solved – with the help of an AP Engineer and the outstanding AP line of coated abrasives. Let us prove it in your finishing department! Have your distributor ask an AP Engineer to stop in – or write Abrasive Products, Inc., 519 Pearl St., So. Braintree, Mass.

JEWELOX-JEWEL EMERY-JEWEL GARNET AP INC. JEWELITE-JEWEL FLINT-NEW PROCESS

Management Shorts

(*Continued from page 80*)

would sometimes fail, with the 600-lb. piece only half way through the machine. Of course the machine would stop. When this happened, it was not possible to start up again with the piece in the machine, and the metal had to be removed. Because of the nature of the work, it was not possible to bring the piece back and put it all the way through the machine again. The piece had to be scrapped, and this was a big loss.

The machine was of such construction that it would continue to run for a considerable time, even after the power was off. This condition made it possible for the operator to put a piece of metal in the machine when the power was off, and the piece would proceed half way through the machine and get stuck. The piece was then scrapped. It was this condition that we were resolved to remedy.

To eliminate this condition, we placed a green light on the front of the machine, drawing its current from the machine's power line. The operator has definite instructions not to feed a piece of metal unless the green light is on. When the power goes off for any reason, the green light goes out. We are on the safe side with this green light because if the bulb should burn out and not light, the operator will play safe and find out what the trouble is, before feeding the machine.

Already, this little green "go ahead" light has saved us hundreds of dollars.

•

Overhead carrier system handling coil stock from freight car to storage, using electric hoists and hairpin hook, picks up 4 to 6 coils at a time, does the job at cost of 0.7c. per 100 pounds. Manual handling used to cost 2c. per 100 pounds.

•

Chart Helps Count Parts by Weighing

GEORGE S. HULSE, Supervisor of Time Study, F. W. Sickles Company, Springfield, Mass.

The chart below—a table of constants to expedite the calculation of count by weighing—has saved us considerable delay and inconvenience and has been a direct aid in the matter of parts scheduling. Its introduction was brought about when Manufacturing Department *A* consistently reported extensive shortages or overages of small mica silvered films used in its assembly of condensers; and it was revealed by time study in Parts Processing Department *B* that the mathematical cal-

Want "super-production?"

Speed up with production-proved

DISSTON

files and hack saw blades

ESTABLISHED 1840

REG. U.S. PAT. OFF.

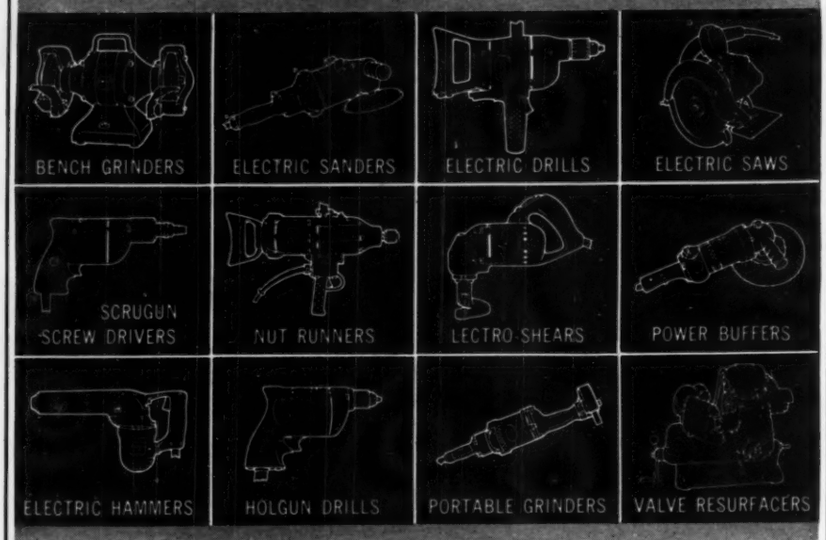
IF you've thrown "business-as-usual" overboard long ago . . . if you're really bent on "super-production" in the 1941 tempo . . . speed up with Disston Bite-Rite Files and Disston Hack Saw Blades.

Faster filing is the rule with Disston Bite-Rite Files because each stroke removes more metal. And a Bite-Rite smooths and levels as it cuts, producing more even finished surfaces. Also, you can get a special Disston File for each special job in your plant . . . to file castings, brass, aluminum, for lathe work, etc.

Speedier sawing in general machine shop production, on long runs or short, is reported by users of Disston Di-Mol Hack Saw Blades. These tough blades keep on cutting, in both hand and machine sawing, long after other blades are dulled or broken. For cutting stainless steels and other tough alloys, use Disston High Speed Steel Hack Saw Blades.

Help for production men is freely offered by Disston. Our engineers can aid you to save money and to increase production in various sawing, filing and machining operations. Write for information today to Henry Disston & Sons, Inc., Philadelphia, Pa., U.S.A.

Over 100 Power Tools



for "All-Out" Production

WHETHER you build battleships or tanks . . . planes or delicate instruments—Van Dorn makes the electric tools to help you put *speed* in "all-out" production!

There are over 100 different types of Van Dorn Portable Electric Tools to cover every production requirement. For drilling, screw driving, sanding, grinding, cutting—or dozens of other operations—Van Dorn builds the exact type, model and capacity electric tool to step up your output. They are available from leading jobbers in key cities, and Van Dorn's nation-wide company-owned factory branches give prompt service on tool repairs.

Ask your jobber to demonstrate the tools you need, or write for complete Catalog to: The Van Dorn Electric Tool Co., 719 Joppa Road, Towson, Md.

"Van Dorn"
(DIV. OF BLACK & DECKER MFG. CO.)
PORTABLE ELECTRIC TOOLS

For Power Specify "Van Dorn"

culation following the weighing of the little films involved not only wide variation in time but many inaccuracies in the results as well. Both were contingent upon the academic background of the girl doing the work.

The former method of procuring count employed by the girl—following a final operation of shearing to size—was to weigh 30 pieces, read on the scales the weight in grams, weigh the entire lot and divide the weight of the lot by the weight of the 30, then multiply by 30.

The table method obviates the factor of division—the one most bothersome to the operator. She now weighs 30 pieces, identifies the constant in the table, weighs the lot, and multiplies by the constant.

Table of Contents

Where 30 pieces weigh (Grams)	*Multiply lot weight by*
1.	30.
1.05	28.7
1.1	27.2
1.15	26.1
1.2	25.
1.25	24.
1.3	23.1
1.35	22.2
1.4	21.3
1.45	20.7
1.5	20.
1.55	19.3
1.6	18.7
1.65	18.1
1.7	17.7
1.75	17.1
1.8	16.7
1.9	15.8
2.	15.

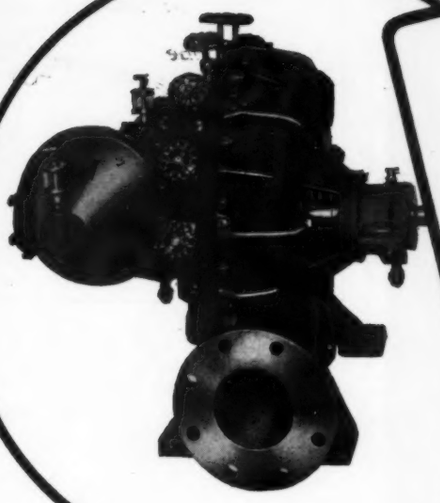
Inspection Light for Narrow Openings

CHARLES JONES, Brooklyn, N. Y.

In the manufacture of tin cans it is often necessary to inspect interior surfaces of the containers. Larger cans having openings of 1 inch in diameter or more did not present a serious problem. Difficulties arose, however, with cans that had smaller nozzles. The first expedient resorted to was a scheme whereby a flashlight lamp was used with two leads of small diameter soldered to its base. The leads had to be small to permit the operator an unobstructed view of the inside of the can.

In spite of the fact that flexible leads were used, they would frequently break off close to the lamp base. This was annoying, to say nothing of broken lamps as they were withdrawn from the container. To eliminate these difficulties the following scheme was used and proved to be satisfactory.

A piece of copper tubing 12 inches long, whose internal diameter was $\frac{1}{8}$ inch, was flared at one end to permit the socket

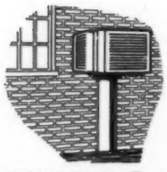


"I BOUGHT HORSE POWER NOT ELEPHANT POWER AND SAVED MONEY"

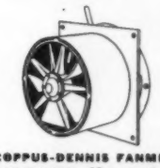
"For small H.P. jobs, I used to buy large-size steam turbines . . . until I learned Coppus makes small sizes. Now I fit the job with a Coppus turbine sized close for my requirements — and save plenty in investment cost."

ASK FOR FREE BULLETINS ON THESE OTHER COPPUS BLUE RIBBON PRODUCTS

(Check the ones that interest you)



☐ **COPPUS AIR FILTERS.** For engines and air compressors. Perfect, uninterrupted filtration. Bulletin F-310-4.



☐ **COPPUS-DENNIS FANMIX GAS BURNER.** New method of mixing gas and air insures perfect gas-air ratio — instant, complete combustion. Bulletin 410-2.

☐ **COPPUS CABLE MANHOLE AND TANK VENTILATORS.** For any confined working space. Special adaptations for boilers, tank cars, shipholds. Bulletin 163-1.

☐ **COPPUS HEAT KILLERS.** Keep production up by keeping men cool. No stale air recirculation. Air is directed. Bulletin 160-4.

☐ Also send Bulletin 135-9 on Coppus Steam Turbines.

ALL COPPUS BLUE RIBBON PRODUCTS

Designed for Your Industry
Engineered for You

Name_____

Company_____

Address_____

City_____

ANOTHER COPPUS BLUE RIBBON PRODUCT... DESIGNED FOR YOUR INDUSTRY

Coppus offers six sizes from 150 H.P. down to fractional — with prices to correspond. Thus you don't have to invest in Elephant Power that you don't need. And here is the story behind Blue Ribbon *performance:*

1. Precision workmanship, controlled by Johansson Size Blocks.
2. Dynamometer tested before shipment.
3. Partial load economy by individual nozzle control.
4. Encased governor, slow speed, leverless.
5. Separate safety trip, pilot-operated, leverless.
6. Vertical or horizontal types; also with built-in speed reducer.
7. Steam, air or gas-operated.

So look for the blue band around the flange. It identifies top quality at an investment cost in line with your requirements.

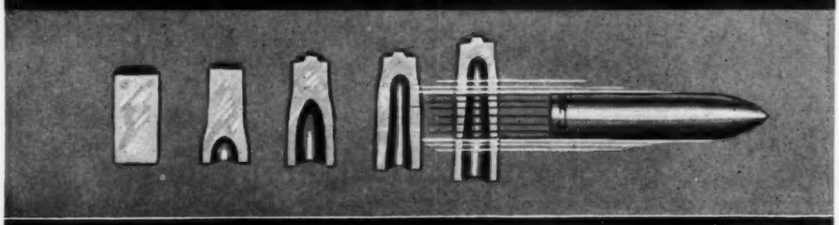
87% REPEAT ORDERS!

The true sign of a Blue Ribbon value: 87% of Coppus Steam Turbines sold in 1940 were repeat orders! Complete facts sent on request. Ask for Bulletin 135-9 using this coupon. Address Coppus Engineering Corporation, 210 Park Avenue, Worcester, Massachusetts.

COPPUS

Sales Offices in THOMAS' REGISTER. See Sweet's Catalog.

SHELLS a-poppin'



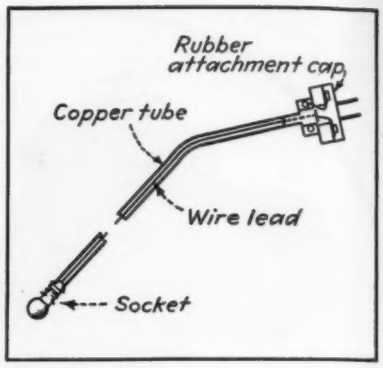
A 90 mm. shell forging from a machine every 12 seconds with the help of "dag" colloidal graphite is a recent report. ❖ ❖ A new shell forging lubricant containing "dag" colloidal graphite is now available nationally from major oil companies. ❖ ❖ Write for Technical Bulletin No. 230V entitled "Colloidal Graphite Dispersions."

"dag" is a registered trade-mark of the Acheson Colloids Corporation

ACHESON COLLOIDS CORPORATION

PORT HURON MICHIGAN

dag — REG. U.S. PAT. OFF. COLLOIDAL PRODUCTS



of an old flashlight to fit in snugly. Before soldering the socket in place a lead was attached to the center contact point. The copper tube formed the second part of the circuit since the screw-shell part of the socket was attached to it. An attachment cap of the cord-grip type was rigidly fastened to the other end of the tube.

In use, the device is plugged into the cord connector end of a trailer of convenient length. A 6-volt lamp is used, and a bell transformer having a 6-volt secondary furnishes the power.

•

Sets Up Department to Handle Priorities

SOURCE: Allis-Chalmers Manufacturing Company, Milwaukee

A new department known as Priorities Management was announced at Allis-Chalmers early in July. Its object is to help in directing the company's activities on matters pertaining to priorities. It is not designed to take over any of the obligations and duties which are now a function of other departments.

Priorities Management will have direction of:

1. Presentation of matters concerning priorities to OPM and all other government departments or regulating bodies including congressional, governmental, or industrial committees.

2. Application of priorities to the company's suppliers of materials.

3. Work being done by the company through its different departments on the matter of industry priorities as distinguished from a priority issued for specific contracts.

4. Helping determine from the interested departments or from governmental agencies such information as will permit the shop to arrive at a proper decision in the problem of conflict of shop schedules between two or more jobs bearing the same priorities.

All departments, including the Tractor Division and others holding prime interest in this subject, are expected to confer with the Administrator of Priorities, or, in his absence, with his assistant, on all subjects regarding priorities before announcements or instructions are issued.

POP'S ALL OUT FOR DEFENSE!

WE'LL FIGHT 'EM WITH NICHOLSON FILES!!
MARCHIN' AS TO ♫ WAR-R-R!
WE'LL GIVE 'EM TH' COLD STEEL!
LES GO!-WE'LL ROUGH 'EM DOWN AN' POLISH 'EM OFF!!
GET A LOAD OF POPSEY'S ARMY!
POP WON'T LEAVE YA JOIN WITHOUT YA GOT A NICHOLSON FILE!

IN THOUSANDS of plants and in the hands of hundreds of thousands of patriotic workers, Nicholson and Black Diamond files are doing a lot toward National Defense.

There is scarcely a metal part or assembling step in the construction of ships, planes, tanks, trucks, guns and heavy shells that does not require some hand-filing. And because of the speed and accuracy required under today's fast-production pressure, the surest, smoothest, sharpest cutting and most uniform files are needed.

Nicholson first-quality brands not only carry the guarantee of Twelve perfect files in every dozen, but in their wide variety of kinds, sizes and cuts enable industrial concerns to choose exactly The right file for the job. Your mill-supply house can help you.

NICHOLSON FILE CO., PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

FOUNDRY FILES — Specially designed for rough filing beyond the service expected of regular files. They have sturdier teeth with heavy-set edges — to resist shelling and breaking out when removing fins, sprues and other hard projections; or when filing narrow edges and sharp corners of dies.

Free Technical Bulletins on Foundry, Die-cast, Stainless Steel, Brass, Aluminum, Die-makers, Shear Tooth, Plastics and Long Angle Lathe files.

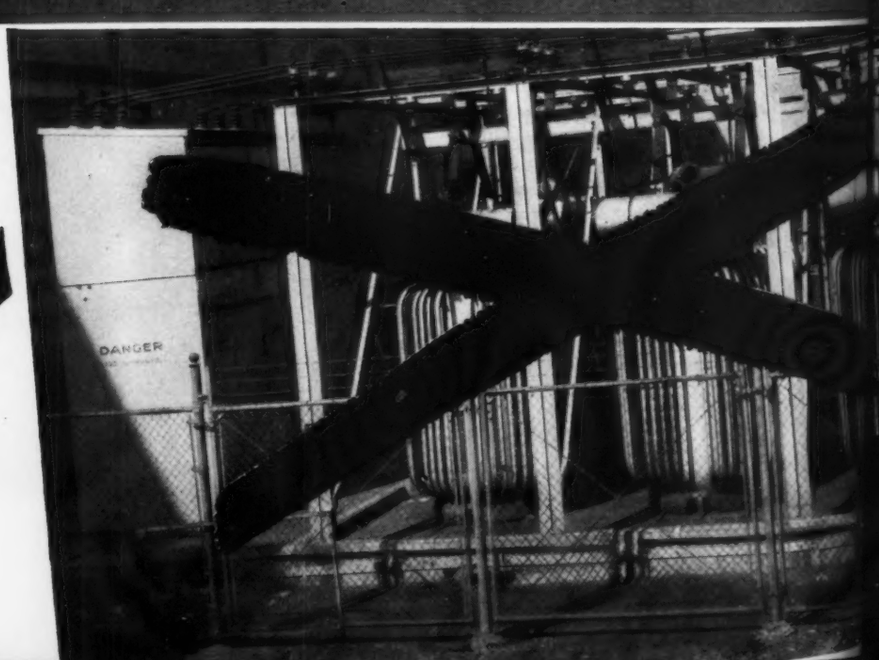
NICHOLSON FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U.S.A.

The New and Better Way

THIS

NOT THIS



Properly co-ordinated for better operation, G-E unit substations are easier to buy, easier to install, more attractive in appearance than old-style, piecemeal substations. And these compact, metal-enclosed units can be located almost anywhere—many times in space that is otherwise worthless.

. . . to Provide Low-voltage Power

★ IN INDUSTRIAL PLANTS

★ IN COMMERCIAL BUILDINGS

★ FOR POWER-STATION AUXILIARIES

NEW G-E metal-enclosed, ready-to-install UNIT SUBSTATIONS—completely factory assembled and fully co-ordinated for dependable operation—offer these distinct advantages:

Greater Safety

Metal-enclosing of all live parts means greater safety for personnel. Circuit breakers of proper rating assure adequate protection for equipment.

Quick, Easy Installation—Lower Costs

These units are shipped in two or three *complete* sections—all ready to be bolted together and connected to the power cables.

Build no vaults. Make no long secondary runs. Just set these compact, metal-enclosed units near the load center with an obvious saving in time and expense.

Lower System Investment

System investment and losses are considerably lower because Pyranol* permits installation right at load centers, thereby eliminating long, costly, low-voltage circuits from a distant substation. Performance of motors, lamps, etc. is improved because the voltage-drop in such long, low-voltage circuits is avoided.

Simplified Purchasing

Only *one* purchase transaction, involving a simple, functional specification, is required; the entire equipment comes from one manufacturer. The purchaser is thus relieved of all design and co-ordination problems.

THESE standard *unit substations* are now available for serving loads 600 volts and below (120/208Y, 480 volts, etc.) from incoming lines up to 15 kv. They can be furnished for outdoor as well as indoor installation.

A metal-clad incoming-line section with oil-blast or magne-blast power circuit breakers, a Pyranol* (or oil-filled) transformer section, and a low-voltage feeder section with air circuit breakers comprise these units—smaller editions of the higher-voltage G-E unit substations that have proved themselves in more than 200 central station installations during the last ten years.

Here's the modern way to help assure an adequate, reliable power supply at all times—more important than ever in the light of present conditions. Bulletin GEA-3592 gives further details on these money-saving units. Ask your G-E representative for a copy. General Electric, Schenectady, N. Y.

*PYRANOL is G.E.'s trade-mark for a nonsludging, insulating and cooling liquid that will not burn.

GENERAL ELECTRIC

401-8-170C

A Warship With Sails

and Forced Draft Fans!

BELIEVE IT OR NOT, that's what the U. S. S. Alliance had in 1886! Boilers—equipped with Sturtevant forced draft fans. Sails—used principally to save coal at cruising speeds.

Here was the *first* extensive test of forced draft on a United States warship. And with sensational results!

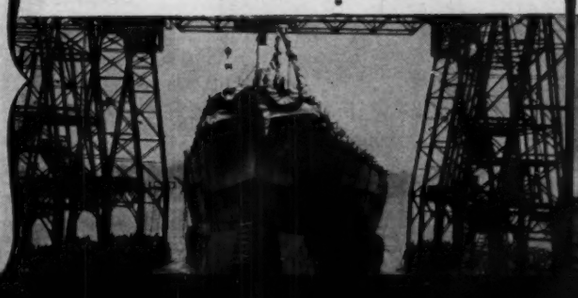
Two of the Alliance's six boilers were eliminated. Coal carrying capacity—increased 40 tons. Boiler power stepped up 50 per cent. And sails finally eliminated from *all* United States warships!

Today Sturtevant forced draft fans and other marine equipment are still playing a vital role in defense. This equipment, in various forms, is installed on a majority of U. S. Navy vessels now in service—will be installed on a majority of these ships now on the ways.

The list of other Sturtevant-equipped ships is almost endless. Famous American passenger fleets—ships that ply our inland waterways—

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work
in the
Marine Industry

U. S. Navy—Recently launched U. S. S. Massachusetts, one of largest U.S. battleships, equipped with Sturtevant draft fans, heaters, ventilators, exhausters, auxiliary steam turbines.



Colliers—Four passenger-carrying Colliers of Pocahontas Steamship Co. are Sturtevant-equipped to eliminate the nuisance of fly-ash and cinder discharge from stacks.

merchantmen of the gigantic Maritime Commission program — cargo vessels and tankers that are holding the life-lines to Britain and her Allies.

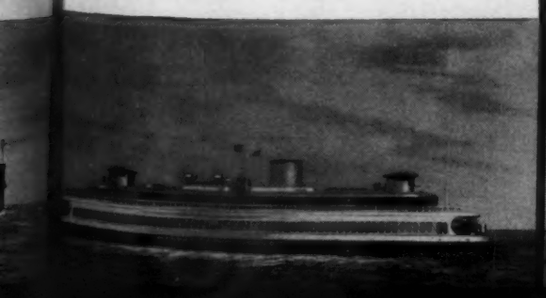
B. F. STURTEVANT COMPANY
Hyde Park, Boston, Mass. *Branches in 40 Cities*
B. F. Sturtevant Company of Canada, Ltd., Galt, Toronto, Montreal

Sturtevant
REG. U. S. PAT. OFF

Puts Air to Work

STURTEVANT — FOUNDER OF THE AIR HANDLING INDUSTRY

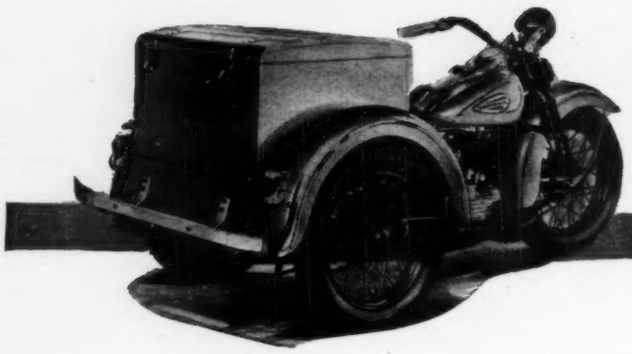
Ferries—Every ferry boat of the famous City of New York fleet is equipped with Sturtevant Ventilating Fans and Forced Draft Blowers.



Cargo Ships—Alcoa Pathfinder and 5 sister Cargo Vessels—built under America's merchant shipbuilding program—are Sturtevant equipped.

Liners—Largest U.S.-built passenger ship Sturtevant-equipped former S.S. America—now in U. S. Government service and renamed the "West Point".

FASTER TOOL CRIB SERVICE WITH *Half* THE TOOLS . . . . *thru*



McCASKEY TOOL CONTROL

Speedier service at crib windows with a fifty percent reduction in tool inventory has resulted from the use of McCaskey Tool Control in the tool room of Harley-Davidson Motor Company, world-famous Milwaukee manufacturer of motor cycles, Package Trucks and Servi-Cars.

PRODUCTION engineers Gordon M. Davidson and William S. Hansen, highspot the outstanding advantages and savings shown by analysis of the first year of McCaskey Control:

"We know definitely what tools are required for operation of the department. As a result, the crib inventory has been cut 50%, even though some items have been added when the need has been indicated.

"The Crib is much better organized. There now is a place for every tool and no time is wasted hunting tools either in the crib or on the production floor. Tools are systematically inspected when returned and immediately reconditioned, if necessary.

"The withdrawal and return of tools is much faster than with brass checks. Our employees would object to returning to the check system. The many results of McCaskey Control actually have exceeded our greatest expectations."

You *know* what tools you need with McCaskey, no more no less; you *know* where every tool is and and how long it has been out, can locate them in a few seconds; no lost time for machines and men; no loss or theft and less breakage; easily installed in the busiest crib; surprisingly inexpensive. Speed-up your production with better tool service. Write today for facts.

McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

TO PRIMARY DEFENSE PLANTS AND IMPORTANT SUBCONTRACTORS:

Nothing less than this Proven and Guaranteed fluorescent lighting system will do today

IVANHOE
"50 & 100 FOOT CANDLERS"
RLM Continuous Wireway
FLUORESCENT LIGHTING SYSTEM
IVANHOE "50 & 100 FOOT CANDLERS" will give you the new, higher illumination you need...30 to 50% lower installation costs... faster installation...simplified maintenance

ILLUSTRATION—PRATT & WHITNEY WORKS FULL SCHEDULE ON DEFENSE ORDERS

MILLER-IVANHOE INSTALLATIONS

Springfield Armory • Frankford Arsenal • Curtiss-Wright Corp. • Grumman Aircraft • Republic Aviation Corp. • Fairchild Aviation • DuPont Company • Eastman Kodak Co. • Hercules Powder Co. • Liberty Aircraft Products • Uxbridge Worsted Co. • Sperry Gyroscope Co. • Ranger Engineering Co. • Pratt & Whitney • United American Bosch • New York Shipbuilding • Combustion Engineering • The Austin Co.

●

Only IVANHOE "50 & 100 FOOT CANDLERS" give you . . .

HIGHER ILLUMINATION—50 to 100 foot candles—for faster, better production—greater worker efficiency.
30 TO 50% LOWER INSTALLATION COSTS—Fixtures contain up to 80% of necessary conduit—make defense dollars go further.
FASTER INSTALLATION—Steps up building schedules—plants get into production quicker.
UNIFORM LIGHT DISTRIBUTION—Production equipment can be moved at any time without necessity for changing lighting.
SIMPLIFIED MAINTENANCE—Easy to clean, removable porcelain-enamel reflectors—save valuable man-hours for production.
ALLOWANCE FOR FUTURE LIGHTING NEEDS—Illumination increases up to 45% practical without new fixtures—lower obsolescence.

● **Use IVANHOE "50 & 100 FOOT CANDLERS" today for more production . . . better production . . . lower costs. Get all the advantages of the ORIGINAL continuous fluorescent lighting system, recently acclaimed by lighting experts as *"the new lighting standard for industry."***

Don't gamble time or money. IVANHOE "50 & 100 FOOT CANDLERS" are not alone guaranteed, but *proven* . . . proven by more than two years intensive service in America's armories and arsenals, aviation plants, precision instrument companies, key defense plants of all kinds.

No other fluorescent lighting equipment wears such service stripes.

Whether you are a primary defense plant or doing vital sub-contracting . . . your job is too important to your country, your customers and yourself to deny your organization the benefits of IVANHOE "50 & 100 FOOT CANDLERS." Give your workers *the best possible working light* . . . your production manager *speedier output* . . . your treasurer *lower costs* . . . and yourself the satisfaction that you not only have the ideal lighting system for today, but adequate protection for tomorrow's changed lighting needs. Write for full facts.

Prompt Deliveries—Superlative Service

We are constantly striving to keep deliveries moving smoothly, fast and ahead of building schedules. And no major installation goes in without a Miller engineer on the scene . . . to live with the job until it is operating with maximum results for you.

For Offices, Drafting Rooms and Similar Installations . . . Use Miller Troffers

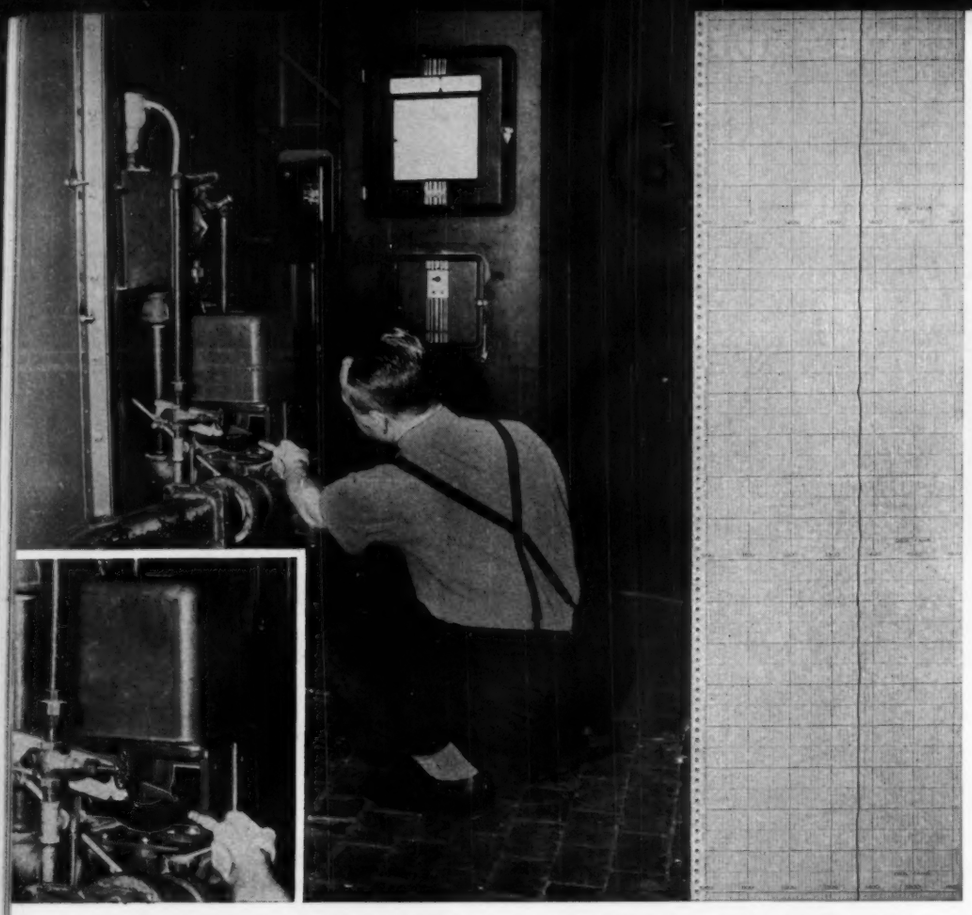
MILLER TROFFERS—continuous recessed fluorescent lighting system — are ideal for offices, drafting rooms and even factories with acoustical or other hung ceiling constructions. Proven and guaranteed, they, too, are providing better light and increased worker efficiency for many progressive organizations. More than 25 miles of MILLER TROFFERS are in service today. Ask for Bulletin 26.

THE MILLER COMPANY

MERIDEN, CONN.

Pioneers in Good Lighting Since 1844

• MILLER OFFERS A COMPLETE LINE of incandescent and fluorescent lighting equipment, backed by almost 100 years of commercial and industrial lighting specialization. There is an answer to your problems in this unbiased lighting service.



The Micromax Controller on the panel shows that it's holding temperature steady, and the man is looking at the Controller's valve-drive to see the motion by which the instrument causes such control.

ASK THE FUEL VALVES

Whether Micromax Pyrometers Are Alert!

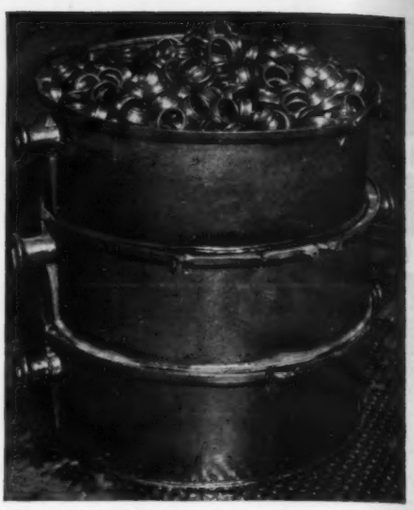
It's a temptation, as you look at the smooth record of a Micromax Controller chart, to think that the instrument can't be particularly alert. That red line, wiggling its endless way up the paper but staying usually within a few degrees of correct temperature, just doesn't seem to reflect any great activity on the part of the Controller. And if the furnace operation is fairly "smooth" by nature, the Controller's activity may seem even less, because its record may not show so much as a wiggle for minutes at a time.

But, take a look at the other end of the Micromax Control equipment. See the steel-housed machine which carries out the Controller's orders, by moving the fuel valve when and as the instrument directs.

That machine's pointer is almost always moving. Its pace may be that of an hour-hand, or it may move back and forth quickly. But it's always busy, as the controller throttles the fuel up and down—down and up again—swiftly matches every temperature change, big or little, with an exactly proportional change in the heat supply. Micromax doesn't dodge the job of alert control. It simply makes control *look* easy.

And that's why Micromax is picked for so many of the important jobs of control, in so many industries. If you have such a job, you'll be interested in the further facts about the Controller in our Catalog N-00A.

Jrl Ad ENT-0600C(33)



Typical load of 800 lbs of bearing races, ready for carburizing by Homocarb Method.

REJECTS IN CARBURIZING ENDED BY HOMOCARB METHOD

The problem of how to carburize the cones for ball bearings was solved some 2 years ago by one of the large producers, when he turned to the Homocarb Method, as illustrated here. Gone are all rejects; cones pass through the carburizing operation on rigid schedule, and every one is accepted for finishing by the production departments.

These cones are made of No. 4615 (moly) steel. They are carburized at

Loading races into Homocarb Furnace

1700 F, to a case depth of 55 thousandths of an inch, and are quenched in oil, directly from the Homocarb Furnace. They get no special handling; they go through in 800 lb batches and the battery of three big Homocarbs works 24 hours a day. The fully-automatic controls of the Method produce a uniformity of results which the heat-treaters never secured before, and furthermore enables each man to "stretch" his skill so that both manpower and materials are used with greater effectiveness.

LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

SKILSAW TOOLS speed up production in this busy defense plant!

Swift, easy cuts in 16-gauge channel steel are made with SKILSAW and a friction blade.

EVERY kind of Skilsaw Tool is used on all these operations to get work done faster!

Skilsaw Model "G" Disc Sander smoothes down welds faster. Also sands, buffs, prepares for finishes.

Skilsaw Model "SL" Disc Sander speeds up all grinding, metal cleaning, filing, surfacing on steel castings.

Skilsaw Zephyrplane Belt Sander swiftly removes scale and grit from metal even well.

Faster drilling is easy—even in close quarters—with compact, rugged Skilsaw Model 43 Drill.

Famous Skilsaw Model 80 Drill—quickly drills holes for handles on insulated doors.

SKILSAW TOOLS MEAN SPEED . . . and

America *demands* speed in a plant working 95% on direct defense orders! That's why this busy factory (name on request) uses every kind of SKILSAW TOOL to save more time on more operations, to speed deliveries of Army and Navy bakery equipment, to hasten America's vital defense.

Are you making deliveries on schedule? Are there jobs in your plant that should be done sooner? Those are the jobs that could be done faster . . . with SKILSAW TOOLS. Call your distributor for a demonstration.

SKILSAW, INC., 5043 Elston Ave., Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Kansas City • Atlanta
New Orleans • Dallas • Los Angeles • Oakland • Seattle • Toronto, Canada

SKILSAW PORTABLE ELECTRIC TOOLS

YOUR DISTRIBUTOR WILL GLADLY DEMONSTRATE THESE TOOLS ON YOUR OWN WORK

SUBSTITUTE *and* IMPROVE

with **JOHNSON**

Ledaloyl
SELF LUBRICATING
PATENTED
BRONZE

● The present emergency is changing a lot of customs both in design and in purchasing. It offers an unusual opportunity to improve. For instance, many manufacturers who formerly depended on zinc . . . steel . . . other metals and materials for bearings, have changed to Johnson LEDALOYL. In practically every case they found a distinct improvement in performance . . . in bearing life . . . in economy. Isn't there a chance that Johnson LEDALOYL . . . the newest development in powder metallurgy can help you? Your inquiry carries no obligation.

JOHNSON BRONZE
512 SOUTH MILL STREET
NEW CASTLE, PA.

WHAT'S NEW IN EQUIPMENT

Mastic Board

An asphalt mastic board is composed of a high melting point asphalt in combination with a fine mineral aggregate, sealed between dry non-bleeding liners to provide a waterproof, rigid, non-warping board. Both acid- and alkali-resistant, it may be formed into various shapes, or corrugated. Available in thicknesses from 80 to 120 calipers, widths up to 50 ft., and in any desired length. It is black in color, and will readily take a surfacing finish.

Also available is a reinforced sheet made with a center core of expanded metal laminated between sheets of asphalt mastic board. This product combines the properties of the regular mastic board with the tensile strength of the metal core. Keystone Asphalt Products Co., 43 Ohio St., Chicago.

Anti-Sabotage Light

Light designed for use in protective-fence lighting systems uses a Fresnel type heat-resisting lens to produce a wide horizontal spread of light and a relatively narrow vertical beam. Reflector for the unit is made of chromium-plated copper. Lens and reflector are assembled into a sheet-steel housing. Complete luminaire is available in series or multiple types for a maximum of 6,000 lumen series or 300-watt multiple lamps. Special bracket enables the unit to be adjusted in the horizontal and vertical planes. General Electric Co., Schenectady.

Noise Reducers

For reducing the detrimental effects of noise upon workers, MSA Ear Defenders reduce loud noises by 35-45 decibels, or to about 1/10 their former loudness, yet are so designed that warning signals and conversation can easily be heard. Each Ear Defender is a tapered tube molded from surgical-type soft rubber, consisting of two barriers, an outer one of metal and an inner one of soft rubber, separated by an air space. This tapered construction permits easy insertion and removal without danger of touching the ear drum. Can be easily cleaned with soap and water. Mine Safety Appliances Co., Braddock, Thomas, & Meade Sts., Pittsburgh.

Industrial Locomotive

A 65-ton, double-power plant locomotive for general industrial and switching use has recently been announced. Powered

YALE ELECTRIC TRUCKS CUT COSTS, SPEED HANDLING FOR INDUSTRY

Executives know the answer to the speed-up demanded by the National Defense Program. That answer is modernized materials handling—the elimination of waste time, the lowering of handling costs.

All of these may be accomplished by the right kind of materials handling equipment. Yale Electric Industrial Trucks are such equipment. They do more work in less time, maintain the flow of materials, are safer, require less time out for maintenance, cut handling costs.

Executives are buying more Yale Electric Trucks because they get more ton miles per handling dollar. Operators like them, too. They find they are safer, have greater visibility and are easier to operate.

Find out about this Yale line of Electric Trucks. There is a type for your every handling need. Call in your nearest Yale representative. Ask him to show you how Yale Electric Trucks can speed your operations, cut your costs. Or, write to us for full information.

THE YALE & TOWNE MANUFACTURING CO.

PHILADELPHIA DIVISION—PHILADELPHIA, PA., U. S. A. **IN CANADA: ST. CATHARINES, ONT.**

YALE

World's oldest and largest makers of Materials Handling Equipment, including Hand and Electric Hoists, Hand Lift Trucks, Electric Industrial Trucks and Tractors, Skid Platforms, and allied products.

KNOCKS DOWN both dangerous fires!

SUPPOSE a paint dip-tank bursts into flame? What if an electric motor catches fire? Can your extinguishers handle those blazes?

These two types — electrical and flammable liquid fires — are hazards which threaten 19 out of 20 industrial plants. They are the blazes which LUX extinguishers are engineered to fight. Without the ability to smother these fires you simply haven't got fire protection.

LUX equipment hits these blazes in a hard-hitting blizzard of carbon dioxide snow-and-gas, lightning-fast extinguishing agent. Use LUX portables for ordinary hazards. Install built-in LUX systems for the intense, concentrated hazards, like storage spaces, tanks or kettles for flammable liquids and solvents.

LUX protection means *added* protection. It means *plus* values in your plant's day-and-night safety.

HERE ARE THE *PLUS VALUES* IN FIRE-FIGHTING

1. LUX carbon dioxide gas is one of the fastest known extinguishing agents.
2. LUX extinguishers are effective on both electrical and flammable liquid fires.
3. LUX gas is clean, non-damaging, non-contaminating, non-toxic.
4. *45,000% expansion* drives LUX gas throughout fire area, despite obstructions.
5. Annual recharging is not necessary with LUX. Simply weigh periodically.
6. LUX service depots are maintained in principal cities.

LUX SNUFFS OUT FIRE

Walter Kidde & Company
Incorporated
1112 West Street, Bloomfield, N. J.

with two supercharged diesel engines developing 200 hp. each, the locomotive has a tractive force of 39,000 lb. at 30 percent adhesion. Over-all size is 12 ft.

high by 9 ft. 6 in. wide by 33 ft. long, from bumper to bumper. Total weight, in working order, is 130,000 lb. The locomotive is built for both standard and 36 inch gage track.

Eight drive wheels, each 33 in. in diameter, are arranged on two 4-wheel trucks, each equipped with 2 high-speed generators and 4 high-speed motors. H. K. Porter Co., Inc., 4938 Harrison St., Pittsburgh.

Industrial Washfountain

A feature claimed for the Mercury washfountain is the introduction of water through ten small individual sprayheads, equally spaced about the inside edge of the rim of the fountain bowl. It is claimed that this design prevents water from splashing over the rim onto the person washing.

"Leg control" is available on one model. A metal pad projects through the rim of the fountain directly under the sprayhead which it operates. Pressure on this pad by the leg of the person washing turns on the water. The instant pressure on the pad is released, the water automatically shuts off. In the "Individual Control" models a half-turn of any spray head turns the water from that head. "Single Control" fountains feature a single valve to operate all sprayheads.

In all models water is used only after it has passed through an automatic temperature control valve. Powdered, liquid, or bar soap equipment is avaliable for attachment to all models. Available in 36 or 54 inch diameters. Standard Washroom Equipment Co., 1000 S. Niagara St., Saginaw, Mich.

Pumps

Series of single and two stage Westco turbine pumps, incorporating an improved type of patented renewable liner, have recently been announced. Exclusive feature is claimed to minimize shut-down losses and production delays. Liners, forming the liquid channel within the unit,

Balance

IS IMPORTANT TO US

AMERICAN ENGINEERING COMPANY

BALANCE IS IMPORTANT IN HOISTS

LO-HED, the *Balanced* Hoist. You'll recognize a Lo-Hed hoist at first sight—it looks different. But remember the reason for this difference because it is dollar-important to you. Take a look at the picture above. See how motor and drum are arranged about the beam. Logical, isn't it? Motor and drum are parallel, connected by efficient spur gears. Note carefully how the hook can be pulled up close to the beam—no headroom wasted. Did you ever see a simpler, more practical design? Best of all, the efficiency, durability and accessibility of a Lo-Hed hoist are reflected in low operating and low maintenance costs. Make your next hoist a Lo-Hed. Write for Lo-Hed catalog today.

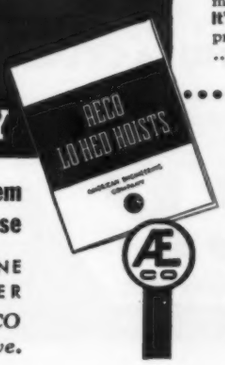
LOOK AT THE BALANCED LO-HED!

It Costs Less To Operate—All gears are efficient stub-tooth spur gears running in a sealed oil bath . . . gear shafts and trolley wheels are equipped with heavy-duty ball or roller bearings.

It Costs Less To Maintain—Sturdy construction . . . seldom, if ever, requires removal from rail . . . covers of controller, motor, drum and gearing are easily removed.

It's Safe—Factor of safety of over 5 at full capacity . . . 100% Positive Automatic Stop when load reaches upper limit . . . Automatic Holding Brake prevents load from drifting when current is shut off . . . short, strong shafts minimize torsional stresses.

It's Protected—Controller is fire, dust and moisture proof . . . motor totally enclosed . . . gearing sealed in . . . motor and drum covered by easily removable covers.



The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative.

AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia

☐ Please send me your complete catalog of LO-HED HOISTS.
☐ Ask your representative to get in touch with me promptly.

Name_____

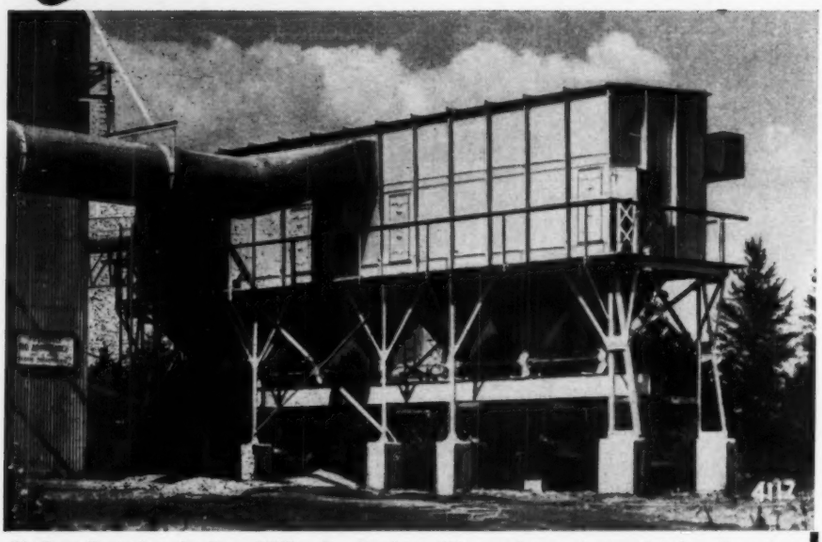
Company_____

Street Address_____

City_____ State_____
(Please print plainly)

• An Aid to Greater Production

SLY DUST CONTROL



Sly Dust Control at the Staso Milling Co., Pembine, Wis., producers of granulated roofing stone.

IN these days of high-speed production, Sly Dust Filters are of vital aid in making cleaner plants, helping maintain quality of product, saving maintenance costs, and protecting health and safety of employees.

Exclusive advantages in Sly Dust Filters:

(1) Greater filtering capacity because of more filtering cloth.

(2) Taut bags at all times, saving power and resulting in quicker removal of dust.

(3) Bags more easily replaced.

(4) Automatic control (any degree) minimizing or removing the human factor.

(5) Simpler shaker mechanism resulting in savings in maintenance and operation.

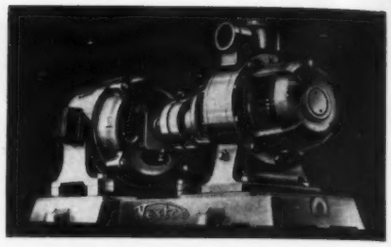
Whatever your dust problem, write us. Sly engineers are experienced with all kinds of industrial dusts. We shall be glad to tell you what advantages you, too, can realize, and give you full particulars.

THE W. W. SLY MANUFACTURING CO.

Branch Offices in Principal Cities

4755 Train Avenue **Cleveland, Ohio**

SLY
INDUSTRIAL DUST CONTROL



can be easily renewed (along with the impeller), providing "stand-by" service.

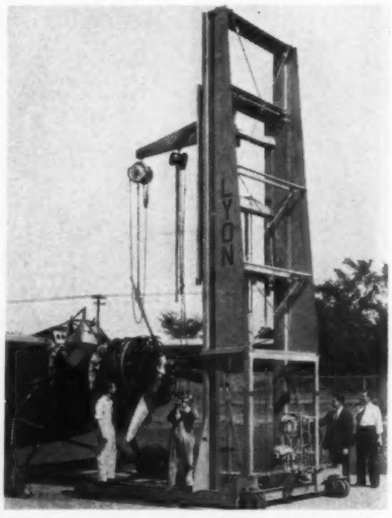
Separate liner design also guards against premature obsolescence by permitting the pump capacity and range to be altered, within reasonable limits, in the field. This alteration is accomplished, without disturbing the suction or discharge lines, by replacing the liners with a different set, and slipping a new, matching impeller into position.

Other constructional advantages include (1) double anti-friction bearing construction, (2) top discharge, (3) stainless steel shaft and "free-floating" impeller, (4) extra deep stuffing boxes and (5) balanced bearing arms.

Designed especially for high-head low-capacity work, pumps are built not only for conventional service, but, also are engineered to meet industrial applications requiring high-pressure performance. Single 2-stage pumps, with 5 in. impellers, will develop pressures up to 150 lb. and 300 lb. per sq. in. respectively at 1,750 r.p.m. Suited for brine circulation, steam service, liquid transfer, filtration, air conditioning, beverage and food (liquid) pumping, booster service, spray equipment, washing machines (industrial), water supply systems, laundry and dry cleaning work. Micro Westco, Inc., Bettendorf, Iowa.

Hydraulic Portable Elevators

Hydraulic portable elevators, designed for installing or removing the engines on large bombing planes, has an elevating boom as well as a removable elevating platform, so that it can be used either with or without the platform. Capacity is 5,000 lb. Platform is 6 ft. wide by 7 ft. long. Lowered height of platform 2 ft., elevated height 16 ft. Boom swings 12 in. each side

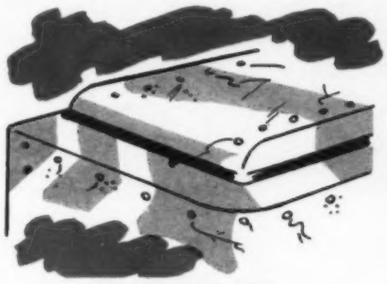


We Gave Our Green Men a Green Light

PHILLIPS SCREWS PERMITTED FASTER WORK WHERE SLOTTED SCREWS DEMANDED EXTRA CAUTION

THEY WERE RAW

New, inexperienced workers were slowing down assemblies. We couldn't use power drivers for fear of driver slippage. Still there were work-spoiling accidents.



BOTCHED WORK

Everywhere — particularly where *new* men were at work — we noticed slow, awkward, two-handed driving . . . scratched surfaces . . . screws fumbled, burred, not set up tight.

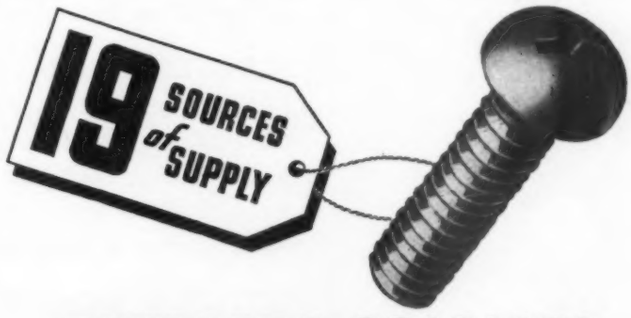
PRODUCTION OFF SCHEDULE

That decided me. Why not use screws that don't let the driver slip . . . that permit use of power drivers even by green men. So I said . . .

"Try Phillips"

And it worked! The assembly time saved permitted us to meet our delivery dates . . . and our overall cost was lower.

Investigate for your plant . . . get further facts about the many screw-using factories that have standardized on fast-driving, easy-seating Phillips . . . and get them *now*. Write to any one of the firms listed below.



PHILLIPS RECESSED HEAD SCREWS

Speed Product Deliveries by Cutting Assembly Time

WOOD SCREWS · MACHINE SCREWS · SHEET METAL SCREWS · STOVE BOLTS
SPECIAL THREAD-CUTTING SCREWS · SCREWS WITH LOCK WASHERS

U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Lock Washer Co., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

MORE SNAP!

FOR DEFENSE PRODUCTION
by using time saving

3-M ABRASIVES

☐ **BELTS** for finishing wood, metal, plastics and glass. Fast cutting, long wearing with an enviable reputation for outstanding quality.

CHECK THIS AD
Send for further information

☐ **DISCS** for cutting down welds, removing nibs and conditioning metal with greater speed and economy.

☐ **SLEEVES** for sanding those hard-to-get-at areas, where it is difficult to reach with ordinary abrasives, such as carvings, moulds, dies, jigs, hub bells and a large number of metal parts.
CONES
BANDS

☐ **UTILITY ROLLS** conveniently placed over workbench where exact length strips can be torn off to be used economically on all metal sanding jobs.

OUR ENGINEERS STAND READY TO AID YOU
If you have production problems related to the use of abrasives, the experience of our sales engineers may help you—feel free to call upon them—there is no obligation.

Made in U. S. A. by
MINNESOTA MINING & MANUFACTURING COMPANY
SAINT PAUL MINNESOTA
Branches in Principal Cities

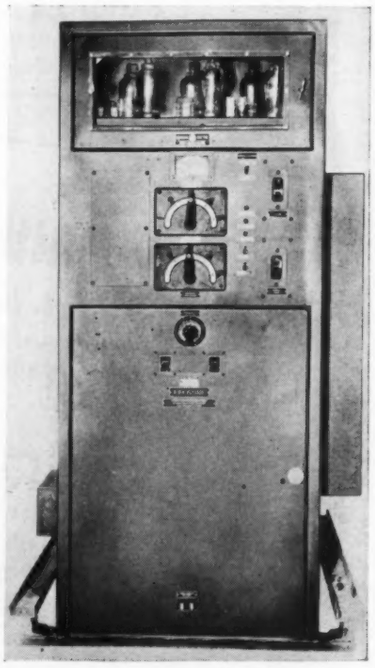
of center, operated by hand chain through worm and gear. The lowered height of boom from floor to center of pin for chain falls is 9 ft. 5-½ in. Pin may be placed 7 ft. out from carriage, or at intermediate points. Elevation of boom 14 ft.

Unit is 9 ft. wide over-all, 12 ft. 6 in. long, and 26 ft. high. Equipped with eight 12 in. x 4 in. rubber-tired wheels.

Platform and boom are elevated by hydraulic hoist and 3-hp. motor-driven hydraulic pump. Elevating and lowering controlled through Solenoid valve operated by "dead man" type controller. One station is located on elevating carriage conveniently located to operate from platform and a controller is mounted at frame base also. Lyon-Raymond Corp., formerly Lyon Iron Works, 846 Madison St., Greene, N. Y.

Capacitor-Discharge Control

Capacitor-discharge control specially designed for use with stored-energy type resistance-welding machines is announced. Electric energy is stored in the capacitors of the control by a charging circuit, and then rapidly released into the welding transformer, the resulting current producing the weld. The charging circuit then recharges the capacitors, and the operation is repeated. Control cabinet contains up to 22 capacitors, any number of which can be used at one time. Two special tap switches select the number of capacitors desired in 1-unit steps, each of 120



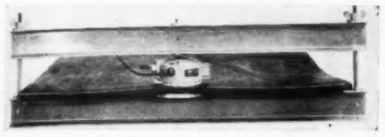
microfarads. Control is contained in a steel floor-mounted inclosing case, 8 ft. 8 in. high (over-all), 4 ft. 3½ in. wide, and 3 ft. 4¼ in. deep. Front portion of the case is divided into three sections, housing rectifier tubes and control equipment, control dials and voltmeters, and a sequence control panel and voltage adjusting potenti-

Several safety devices are furnished. A discharge contactor discharges the ca-

pacity units remotely, by a pushbutton if necessary. A manually operated 3-phase circuit breaker protects the anode transformer in case of a short circuit. If any of the cabinet doors are opened, interlocks automatically discharge the capacitors through the discharge contactor. In addition, a discharge bar is mechanically operated to short out those capacitors which were in use at that time. The remaining capacitors are shorted by means of the special tap switch. General Electric Co., Schenectady.

Patch Vulcanizer

A new tool for maintenance of conveyor belting in the field, Type RO patch vulcanizer has been designed for repairing the covers of conveyor belting. Vulcanizer is



round in shape, 10 in. in diameter, of the single heated platen type. It clamps against a steel plate 12 in. in diameter held against the opposite sides of the belt. The B. F. Goodrich Co., Akron.

Paint Brush Cleaner

Where paint brushes are in intermittent use, Keepkan paint brush cleaner can handle the brush-cleaning job and keep brushes from becoming stiff and matted, it is claimed. Wet brush is placed in brushanger, with bristles immersed in the liquid, and is allowed to stand for several hours while the pigment drains out. Brush

is then soft and clean, ready for re-use or storage. Several sizes available, with capacities from 2 to 5 brushes. Different colors of paint may be removed from several brushes at one time. The Howe Co., Springfield, Mass.

Roll Grab

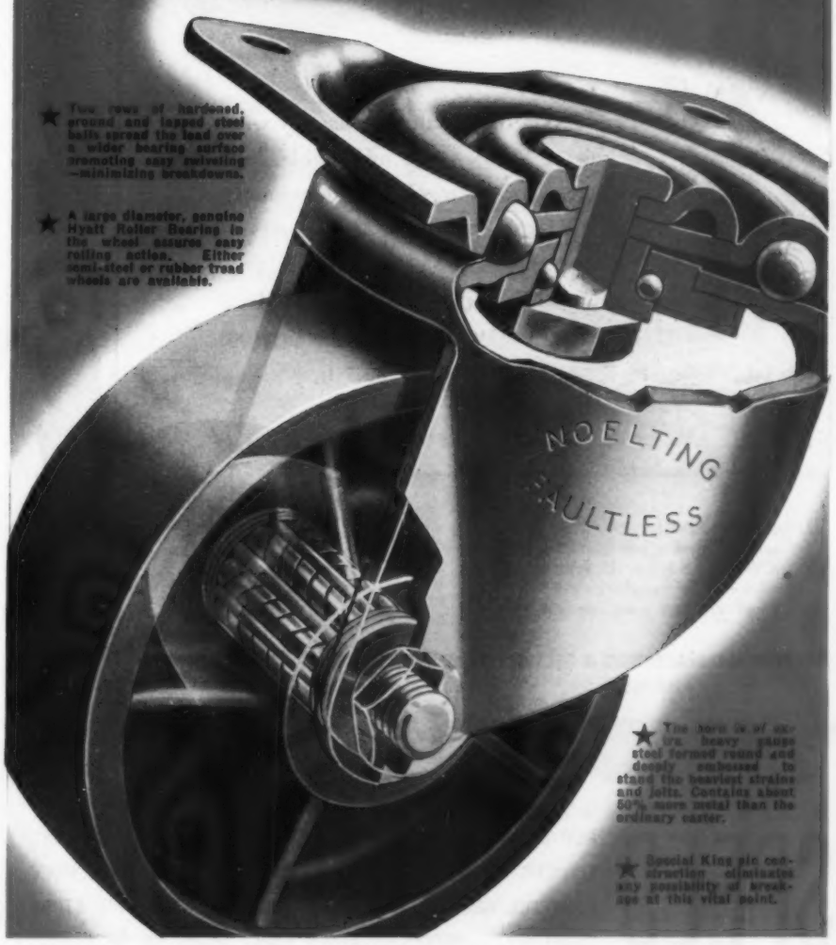
Completely motorized roll grab has recently been developed for use with overhead materials handling systems. Grab will handle rolls from 16 in. min. to 60

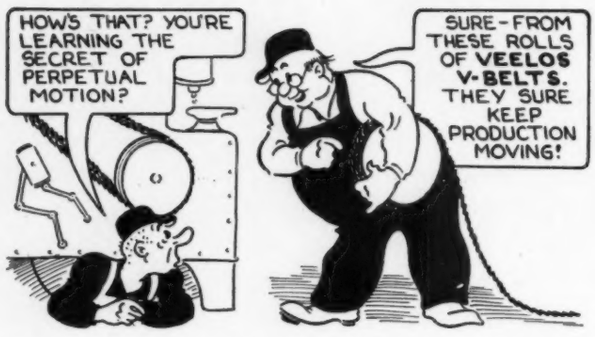
SPEEDING PRODUCTION
TO PRESERVE "THE AMERICAN WAY"

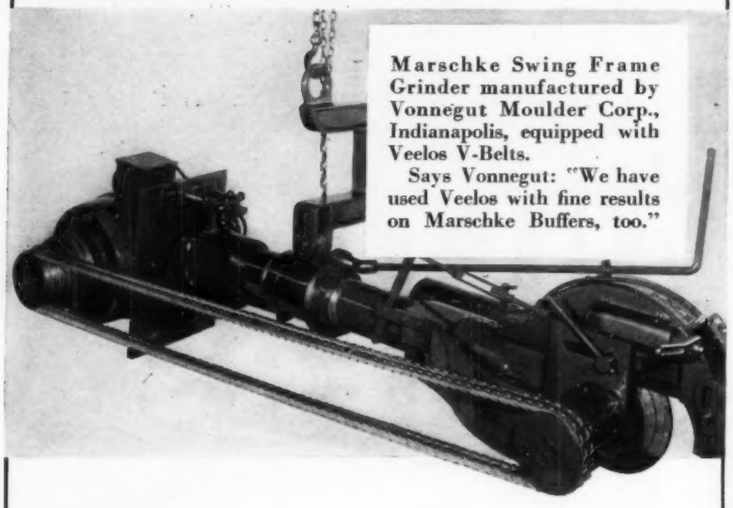
To speed production of defense industries Faultless technicians have developed new Caster designs to give longer life under the punishing strain of stepped-up schedules. That's why Faultless Casters, in thousands of defense plants, keep production lines rolling without costly breakdowns or repairs. Faultless Caster specialists are available to help solve your problems and give the kind of service you want. Simply write us, for literature, or a representative.

FAULTLESS CASTER CORPORATION, Dept. FM-11, Evansville, Indiana
Branches in Principal Cities—Canadian factory: Stratford, Ontario
Member of the American Supply and Machinery Manufacturers Association

FAULTLESS CASTERS


Two rows of hardened, ground and lapped steel balls spread the load over a wider bearing surface promoting easy swiveling —minimizing breakdowns.
A large diameter, genuine Hyatt Roller Bearing in the wheel assures easy rolling action. Either semi-steel or rubber tread wheels are available.
NOELTING
FAULTLESS
The horn is of extra heavy gauge steel formed round and deeply embossed to stand the heaviest strains and jolts. Contains about 50% more metal than the ordinary caster.
Special King pin construction eliminates any possibility of breakage at this vital point.


HOW'S THAT? YOU'RE LEARNING THE SECRET OF PERPETUAL MOTION?
SURE - FROM THESE ROLLS OF VEELOS V-BELTS. THEY SURE KEEP PRODUCTION MOVING!



Marschke Swing Frame Grinder manufactured by Vonnegut Moulder Corp., Indianapolis, equipped with Veelos V-Belts.

Says Vonnegut: "We have used Veelos with fine results on Marschke Buffers, too."

Production drives ahead *smoothly* with drives of Veelos — the adjustable, link V-Belt. Keep a few *rolls* of Veelos handy and you can install or adjust belts in the bat of an eye. Veelos in rolls provides an automatic supply of matched V-Belts of any length . . . assures continuous production. Ask your distributor.

CALL A V-MAN! A more efficient belting layout may increase your production capacity. A Veelos V-Man can tell you how. He's a sales engineer especially trained in power transmission work. Ready when you need him.

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PA.

VEELOS
V-BELT
ADJUSTABLE to any length
ADAPTABLE to any drive

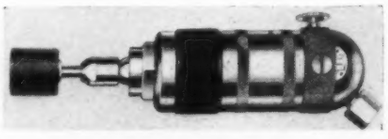
SPEED NEW OCTOPUS FLAT TRANSMISSION BELTING KEEPS MACHINERY RUNNING AT TOP SPEED . . . SPEEDS UP PRODUCTION ! . . . MORE POWERFUL GRIP ENDS SLIPPAGE! GREATER RESILIENCE STOPS STRETCH ! . . . PRODUCED AFTER EIGHT YEARS OF RESEARCH!

in. max. diameter, in lengths up to 72 in. and weights up to 5,000 lb. All motions of the grab are motorized and can be controlled from the crane operator's cab. Three motors are provided. One spreads and retracts the grab arms; another squeezes roll grippers after they have been brought close to the roll; the third operates the turn-over mechanism. When a roll in the vertical position is to be picked up and delivered in a horizontal position, or vice-versa, the turn-over mechanism can be operated while the crane is in motion.

Grab is specially suitable for handling all grades and thicknesses of paper, as well as bales, barrels, boxes. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Pneumatic Grinder

Only 6¼ in. in over-all length, and with a speed of 17,000 r.p.m. for wheels up to 2 in., Model 22BGS pneumatic grinder is compact and sufficiently light in weight



for one-hand operation. Equipped with either lever or button throttle and with spindle extension and collets of various sizes. The Aro Equipment Corp., 108 Madison St., Bryan, Ohio.

Arc Welder

A specially designed arc welder for aircraft construction purposes, known as Aircraft Special has been modified to give the "quick, hot start" necessary to welding light-gage alloy tubular members in airplane construction. It also provides a lower range of welding current specified from 10 to 150 amp. at normal welding voltage. Welds especially well with coated electrodes of 3/32 to 5/32 in. size, without burning through, and with steady progress along the seam due to the "soft arc" that "hangs on" even under low-current conditions. Dual control of welding current and

NO. 8

ALUMINUM, DEFENSE, AND YOU

OCTOBER WAS A MILESTONE MONTH

There have been three other such milestones for civilian uses of aluminum during the past 18 months.

WHEN, ON MARCH 25, 1940, the price of Alcoa Aluminum ingot was reduced from 20c to 19c a pound, it automatically increased the number of civilian applications where using aluminum would be good cost arithmetic.

19¢

Every application carries its own special set of conditions. They determine how much you can pay to save a pound of weight, to get extra heat conductivity, or reflectivity, or what not. 19-cent ingot widened the circle of aluminum's usefulness.

AUGUST 1, 1940 WAS THE SECOND milestone. Economies growing out of greater volume of manufacture, and economies stemming from continuing research, brought the announcement of 18-cent ingot. The civilian manufacturer looking to his future could see, in the offing, more ways to use aluminum than ever before.

18¢

Perhaps you were one of the thousands who filed away in your book of futures the reminder that "when this thing is over, we must figure on using more Alcoa Aluminum."

THIRD MILESTONE showed up almost before you got that note made. November 18, 1940 saw another reduction on Alcoa Aluminum ingot to 17c a pound, making a total reduction of 15% in the midst of a general seller's market.

17¢

Defense got most of the immediate benefit, but the future of aluminum for you, and you, and you, was writ larger than ever.

THEN CAME 15c INGOT, effective Oct. 1, 1941, with accordant reductions in fabricated forms of Alcoa Aluminum. This means that the arithmetic of weight saving is all new, since last you figured on using this versatile metal in a civilian application. When the emergency is over, the fact is that all your old material cost comparisons will be as dead as a dodo.

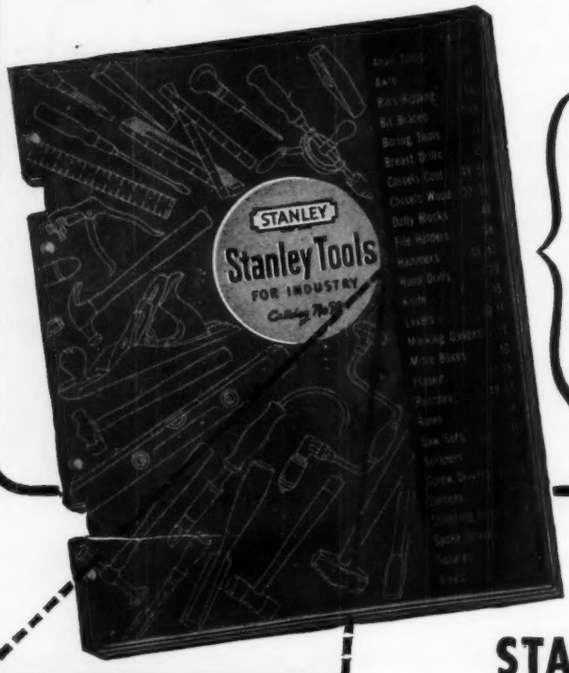
15¢

THE ARITHMETIC IS NEW; but the fundamentals just get more so! More than ever, the strong alloys of Alcoa Aluminum are *the* answer to lightness with strength.

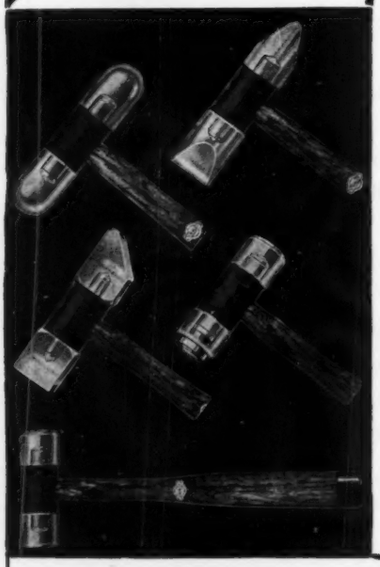
ALUMINUM COMPANY OF AMERICA

"SEND ME YOUR NEW CATALOG OF STANLEY INDUSTRIAL TOOLS"

Requests are coming in fast for this new Stanley Catalog No. 50, describing basic and special-purpose Stanley Hand Tools for industry's use. Write for yours! It's ready-referenced, easy to use – a complete guide to the kind of tools you need in your shop.



Every Index Listing Marks A Complete Line



STANLEY Soft Face HAMMERS

Typical Of Stanley Industrial Tools!

For all kinds of assembly work – light sheet metal forming – aircraft manufacture – these Stanley Soft Face Hammers are ideal. Tips of tough but gentle "Stanloid" composition are easily replaceable. "Evertite" processed hickory handles, with comfortable grips, are securely wedged into steel center body. Your distributor will be glad to supply these tools.

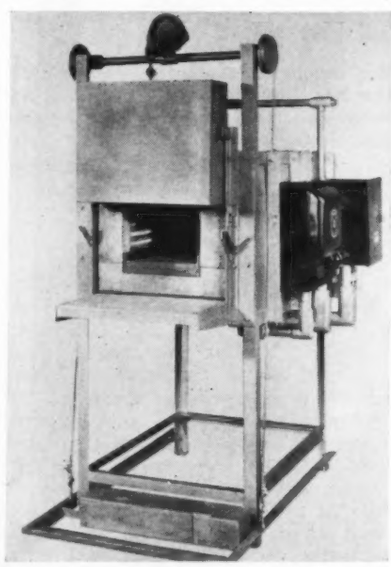
STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
New Britain, Conn.
THE TOOL BOX OF THE WORLD

open circuit voltage enables the operator to select exactly the right volt-ampere combination for each job. Remote control, standard equipment, makes it possible for the operator to make slight heat adjustments after the "hot start" without return to welding machine.

Furnished with convenient links for voltage change-over from 220 to 440 volts or vice versa. Machine is also supplied for 550 volts and special voltages. Models are available either stationary or portable. Portable models are obtainable with steel wheels, or balloon or hard-rubber tires. Hobart Bros. Co., Troy, Ohio.

Box Type and Muffle Type Furnaces

Adapted to a wide range of both general and specific applications in factories, Falcon electric box type and muffle type furnaces can be used for testing metal samples, melting glass samples, burning refractories, oxidation determinations, testing vitreous enamels, heating high speed and similar steels in toolrooms, hardening and tempering. Furnaces are arranged for either floor or bench mounting, equipped with heavy alloy heating elements to assure efficient, long-life operation at temperatures up to 2,300 deg. F. Heating elements are supported in high-grade refractories arranged in top, bottom, side,



INCREASED PRODUCTION *for Defense*

YOU will accomplish this when you take advantage of the cooperative help offered by *Texaco Engineering Service.*

Texaco assures your success in the proper selection and application of both *Texaco Lubricants* and *Texaco Cutting Coolants.*

Engineered for specific uses, Texaco Industrial Lubricants extend bearing life, reduce repair expense and assure efficient lubrication in today's continuous 24-hour operation.

Texaco Sultex Cutting Coolants assure higher output, better finished parts, longer cutter life.

Outstanding performance has made Texaco preferred in the many fields listed in the panel. These Texaco users enjoy many benefits that can also be yours.

A Texaco Lubrication Engineer will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

Tune in FRED ALLEN every Wednesday night. See your local newspaper for time and station.

TEXACO

TEXACO Lubricants and Fuels

FOR ALL INDUSTRIES

RETURN METAL DRUMS PROMPTLY . . . thus helping to make present supply meet industry's needs and releasing metal for National Defense.

YOU couldn't do this YOURSELF!

● Try jotting down weight figures twenty... fifty... or a hundred times. See how easy it is for 283 to become 238 or what-not when you least expect it! While you *read, remember* and *record* vital weight figures... human errors creep in that defy discovery.

What can be done about these losses? *Remove the human factor*—with TOLEDO PRINTWEIGH. Bring *accurate* weight-facts, indicated by the Toledo Dial, *directly* to your basic accounting records. Toledo Printweigh Scales are unbeatable for guarding *your* profit with *right* records!

NO OTHER WEIGHING MACHINE LIKE THIS!

Big Figures for quick, accurate reading. Prints on any size tickets, or strips, with duplicate copies.

Direct Printing for quick, accurate recording. The printwheel is directly a part of the scale eliminating unnecessary bars, cams, etc.

With the Printweigh you get full benefit of the weighing accuracy of the Toledo Scale.

Split Second Operation. The simplicity and directness of the Printweigh give you practically instant action (only 3/5 second to print).

☐ *Write Toledo Scale Company, Toledo, Ohio, for Printweigh literature.*

TOLEDO
PRINTWEIGH
SCALES

Direct PRINTING OF TOLEDO *Accurate* WEIGHTS IN BIG FIGURES

and rear walls of the furnace. Furnace chamber is completely surrounded by durable block type insulation. Made in various standard sizes and can also be supplied in special sizes according to customer specification. H. O. Swoboda, Inc., 134 Thirteenth St., New Brighton, Pa.

Drain and Pipe Cleaning Machine

Electric drain and pipe cleaning machine, known as Niard, has two completely inclosed separate coil spring cables—one ¾ in. in diameter, the other ⅞ in. in diameter, both 37 feet long. The ¾-in. cable with special attachments cleans small

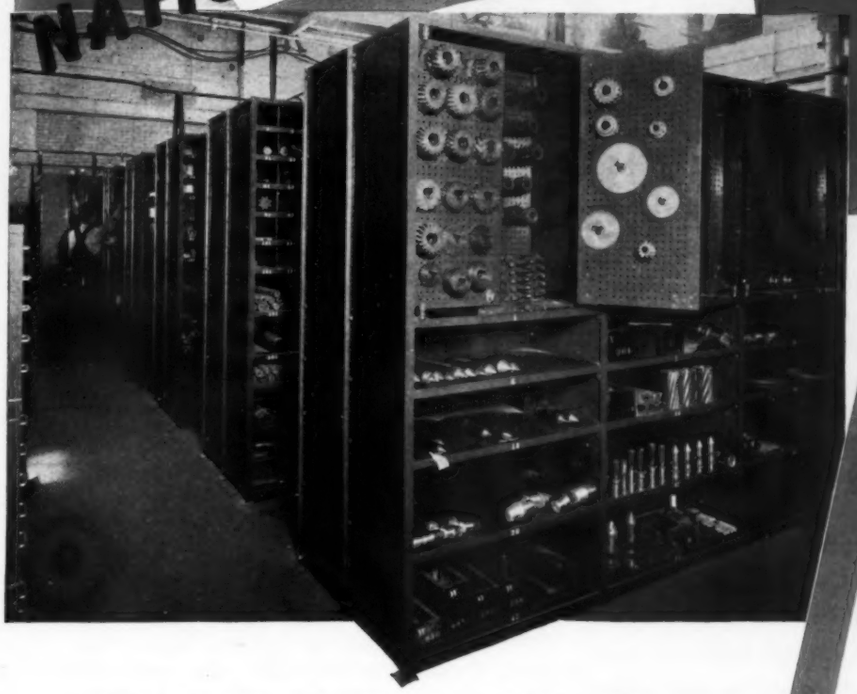
lines, while the ⅞-in. cable, fitted with sharp steel cutting blades easily goes around the sharp bends and curves found in standard plumbing installations. Height of unit is 15 in., width 14 in., weight 40 lb. Roto-Rooter Corp., 2302 University Ave., Des Moines, Iowa.

Emergency Light and Power Units

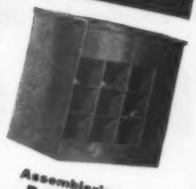
Four new Exide emergency light and power units for industrial use are announced. A reliable source of current that is instantly available during interruptions, unavoidable or caused by sabotage, of the regular a.c. supply, particularly in the engine room and at important control panels. Another purpose of the units is to insure continuity of electric power in delicate manufacturing processes where even a moment's interruption might result in expense and serious loss of time.

Each unit is used in connection with an Exide battery of either the "chloride" or the "flat plate" type. Has an automatic transfer switch that instantaneously transfers the battery to the emergency lighting circuit upon failure of the normal a.c. supply. When the a.c. service is restored, emergency lighting circuits are instantly transferred back to the a.c. supply. Battery is kept fully charged at all

Here's How Lyon Products HELP SPEED UP NATIONAL DEFENSE PRODUCTION



Steel Stools



Assembler's Bench Bin

Machine Tool Cabinet

Steel Work Benches with 3-Shift Inserts

● Scores of plants handling National Defense Contracts are finding Lyon Shop, Storage and Toolroom Equipment a major factor in their race against time. By providing more orderly storage and facilities in less floor area, Lyon Equipment permits maximum use of a minimum inventory . . . releases more space for production. It promotes more efficient toolroom organization to make possible more productive hours for every available die and small tool. It saves precious time on countless operations by accelerating the handling of materials *to* and *through* production.

Write or wire today for catalog showing these industry-proved space savers and work accelerators.

LYON METAL PRODUCTS, INCORPORATED

General Offices: 1211 Madison Ave., Aurora, Ill.

Branches and Distributors in All Principal Cities

LYON STORAGE EQUIPMENT *Service*

Now

AN INDUSTRIAL HAND CLEANER OF A NATURE JUST THE OPPOSITE OF TRADITION

You are used to sand soaps, pumice grit, detergent alkalies—so used to them it probably doesn't seem possible that a powerful cleansing soap could really be gentle in action. That's where you're wrong. Here is one that will loosen the oiliest grime without any sand-scrubbing—or parching effect, either. Non-abrasive corn-meal absorbs the dirt and a special impregnation with lanolin-oil makes it different in action from anything you've ever known.

LAN O KLEEN

in your washroom will give your men something to be enthusiastic about. They'll clean-up with less effort—and less damage to their hands. Whether you realize it or not, harsh caustic soaps don't help skin-health or working efficiency.

LAN-O-KLEEN is worth a lot in helping prevent dermatitis. Even one or two cases can run into a lot of money for compensation claims.

LAN-O-KLEEN is an economy product. Light and fluffy, a little goes a long way.

CLIP THE COUPON

WEST DISINFECTING COMPANY

WEST A GUARANTEED PRODUCT

42-16 WEST ST., LONG ISLAND CITY, N. Y.

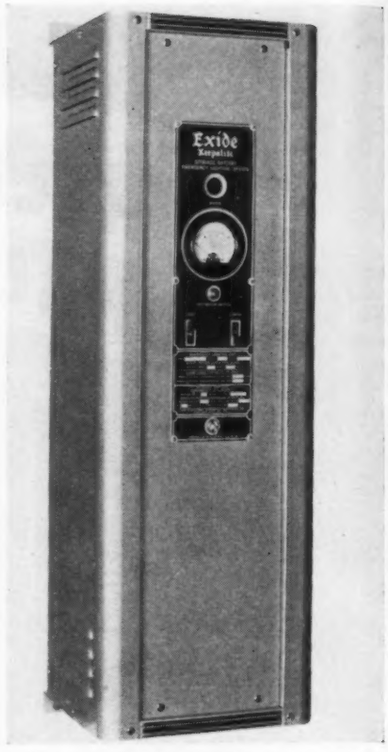
Attention Dept. J

I am interested in your FREE TRIAL offer of a Dispenser and sufficient LAN-O-KLEEN to test out for 2 to 3 weeks in one department. Please get in touch.

Name of Individual.....

Name of Company.....

Street & City.....

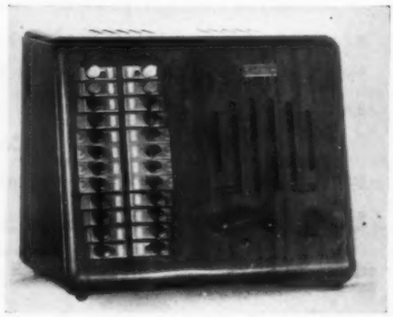


times, because immediately after normal power is restored, it is automatically placed on high rate charge. As soon as the recharging is completed, the high rate is automatically cut off and a copper oxide rectifier then supplies a trickle, or low rate of charge, just sufficient to maintain the battery in a fully charged condition.

Available in capacities of from 3,400 to 10,000 watts. Other systems are available in capacities ranging from 240 to 100,000 watts. The Electric Storage Battery Co., 19th St. & Allegheny Ave., Philadelphia.

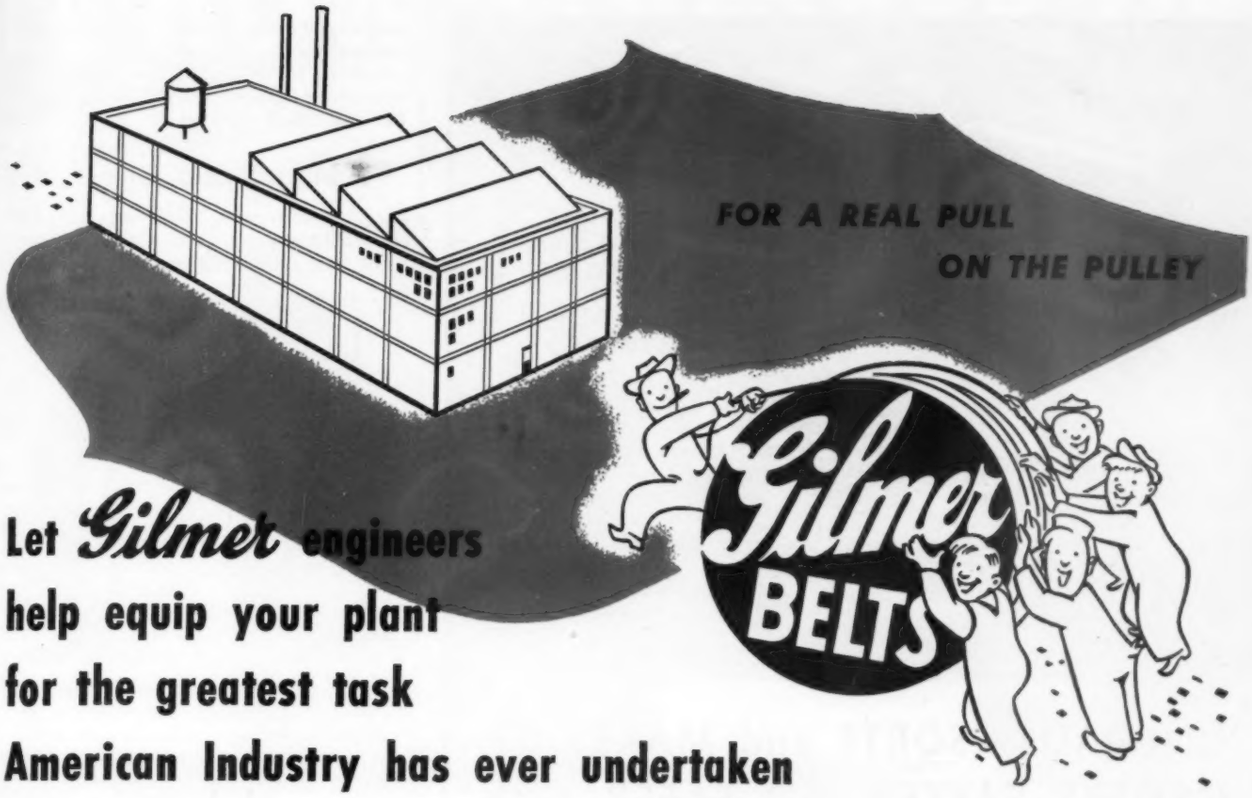
High-Powered Communicator

Confidential or amplified talk on 20 substations is possible with integrated executive station that provides high power for contacting selectivity up to 20 substations



or paging all such stations simultaneously. Substations can be (a) private, free from eavesdropping, or (b) remote, permitting conversation with a man many feet from his station. Superpowered and directional trumpet-type substations are available for noisy locations.

Several executive stations can be connected with each other for complete in-



Let *Gilmer* engineers help equip your plant for the greatest task American Industry has ever undertaken

GILMER'S complete service will help you drive machines at top speed, get maximum production at this vital time. Gilmer engineers go far beyond recommending belts for specific equipment. From their wide experience with scores of industries they can offer you down-to-brass-tacks advice on rearranging drives to get more work out, avoid idle time, reduce spoilage and cut costs.

Call up your Gilmer distributor or write us, today.

L. H. GILMER COMPANY

TACONY, PHILADELPHIA, PA.

"The right transmission belt for every purpose"

GILMER BELT SELECTOR · *Supplement*

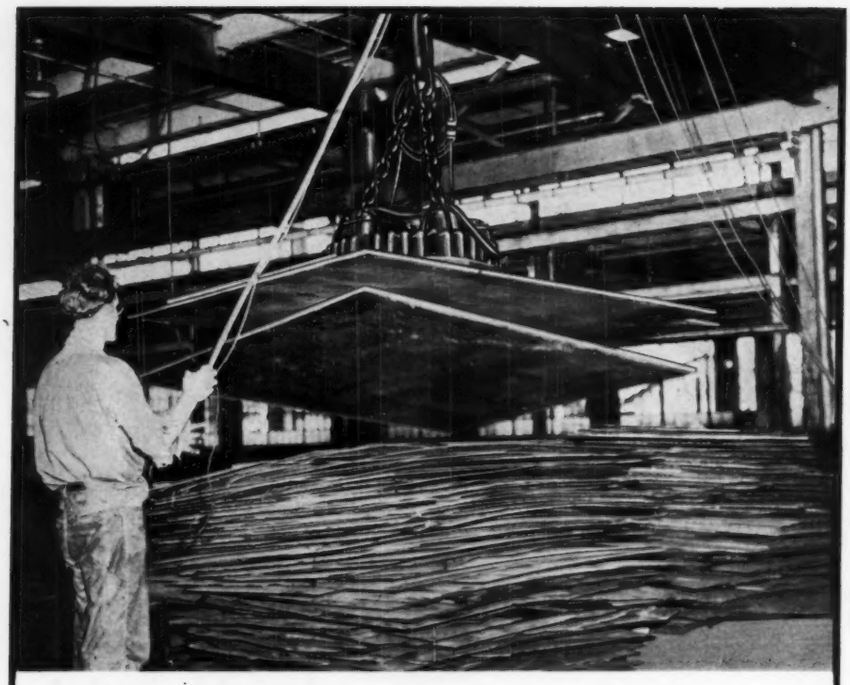
Plant Application	Belt Recommended
Where endless V-belts are impractical because of obstructions.	Gilmer Streamliner V-belting
Extremely high speeds, 10,000 fpm and over, no splice, smooth running.	Gilmer Speedage Fabric Belts
General flat pulley service where low first cost is main consideration.	Gilmer Standard Cut Edge Belting
Round belt drives—mule, serpentine, quarter-turn spindle, cross-drive — on small machinery.	Gilmer Round Endless Belts
Special fabric belts, for special flat drives and light conveyor applications.	Gilmer Cotton Web and Duck Belts

Kable Kord belts are really two belts in one... the top contactor cords make the belt hug the pulleys... less slip, more power. Available in endless styles and in running lengths.

Hevaloid endless belts are for precision work at speeds up to 9000 fpm. Because of its patented process of latex impregnation Hevaloid combines lightness, strength, grip and long life.

RHO belts are oil and heat resisting, last longer, run smoother... ideal for small-pulley drives at speeds up to 7400 fpm.

V-belts are built for strength with minimum stretch, pull with less slip. A complete line for multiple and fractional horsepower applications.



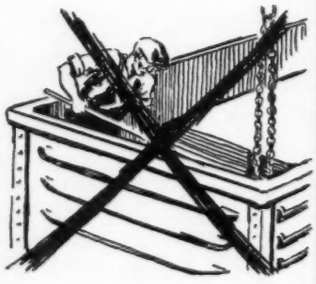
UNLOADS—SORTS and MAKES-UP ORDERS FASTER and SAFER with EC&M LIFTING MAGNET

TO speed up both incoming and outgoing shipments of steel plates, this company has found that an EC&M Type SA Lifting Magnet does these tasks quickly and safely. All manual labor with plate handling has been eliminated.

There is no lost time in prying apart plates to affix chains—no danger of crowbar or chain slippage.

Sorting plates into piles as well as making up orders is also quickly accomplished. Single plates may be picked up or two or more plates may be lifted as needed. If more than the required number are lifted, the operator, by rapidly manipulating his master switch controlling the EC&M Automatic-Discharge Magnet Controller, has become skilled in dropping off plates one at a time until the lift contains the required number.

This is only one of the many ways in which EC&M Type SA Lifting Magnets help speed defense operations. Write for 18-page illustrated Bulletin 900 showing them at work. Fill out the convenient coupon below for your copy and mail it today.



THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

THE ELECTRIC CONTROLLER & MFG. CO.
2700 E. 79th St., CLEVELAND, OHIO

Gentlemen:
Please send me a copy of illustrated Bulletin 900 describing EC&M LIFTING MAGNETS.

Name .....

Company .....

Address .....

ter-communication between important department heads. Each such station can be connected to up to 20 other stations in the system. Executone Corp., 415 Lexington Ave., New York.

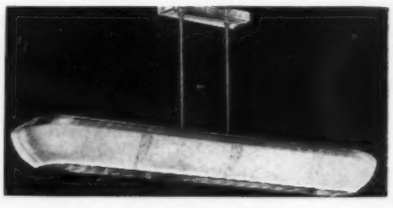
Magnifying Glass

For first aid work, removing particles from eyes, splinters from fingers, Super-Sight gives magnification and light where

needed. Can be moved with finger-tip. Two models available, one that can be attached to the arm of a chair or table, and the other mounted on a pedestal. The Boyer Campbell Co., 640 Antoine St., Detroit.

Fluorescent Fixtures

Known as Streamlite, all-glass inclosed, dustproof fluorescent units have recently been announced. They soften and diffuse light, with an absorption of less than 20



percent and a surface brightness of scarcely 1.5 foot-candles per square inch when lighted with 40-watt tube. Markel Electric Products, Inc., 145 E. Seneca St., Buffalo.

Pipe-Layer

Model MD6 pipe-layer, a tractor side-crane is mounted on the Caterpillar D6 model, has a lifting capacity ranging from 7,300 lb. at 12 ft. overhang, to 23,700 lb. at 4 ft. overhang. Will lift, carry, load, stack, or spot heavy materials or equipment, and can be maneuvered easily in cramped quarters.

Operating mechanism is mounted on the side of the tractor opposite the boom, to obtain maximum lifting capacities. Power is from the rear power take-off of the tractor through an antifriction-bearing mounted twin disk friction clutch. Operation is, therefore, independent of the tractor master clutch.

Boom and load line drums are provided with separate clutches and brakes. Heavy automotive type transmission gives

SEE HOW YOU SAVE TIME

WITH THE TRI-CLAD MOTOR

REG. U. S. PAT. OFF.

Extra Convenience Features

help you get the Tri-Clad motor into service faster—keep it in service with less attention.

1. Easy to Handle

They can be moved into position easily because of their light weight and compactness. The shape of the bearing housings and the location of end-shield fittings make it easy to handle Tri-Clad motors with slings. In addition, they are sturdily built and do not have to be coddled.

2. Quickly Mounted or Altered

Their feet are machined accurately and drilled for standard mounting bolts. The reversible stator puts the roomy conduit box on the most convenient side and the end-shields can be rotated to any of four positions to meet mounting requirements.

3. Easy to Wire

A large, four-position conduit box gives unrestricted working space. It can be quickly removed for wiring. Flexible leads are pressed on the terminals which are permanently identified. No soldered connections are necessary. A stainless-steel, graphic connection plate is conveniently located on the conduit-box side of the motor

4. Convenient to Lubricate

All Tri-Clad motors have a large oil or grease capacity. On sleeve-bearing motors, the oil-filler gage can be located on either side of the bearing housing. A spring cover on this gage permits quick checking of the oil level. On ball-bearing motors, a pressure-relief greasing system assures rapid and thorough greasing.

BUILT FOR PROTECTION FIRST . . . TO LAST

The new General Electric Tri-Clad motor is a cinch to install. Its convenience features pay off in precious minutes saved—both for those who build motors into machines and for those who use them in a plant.

Next time you order motors, take *time-saving* into account, along with protection and performance; make sure you get Tri-Clad motors—now available in a wide range of types and integral horsepower sizes to 20 hp.

Write for Bulletin GEA-3580 which gives full details about these extra protection features and other Tri-Clad motor advantages.

Extra Protection 3 Ways

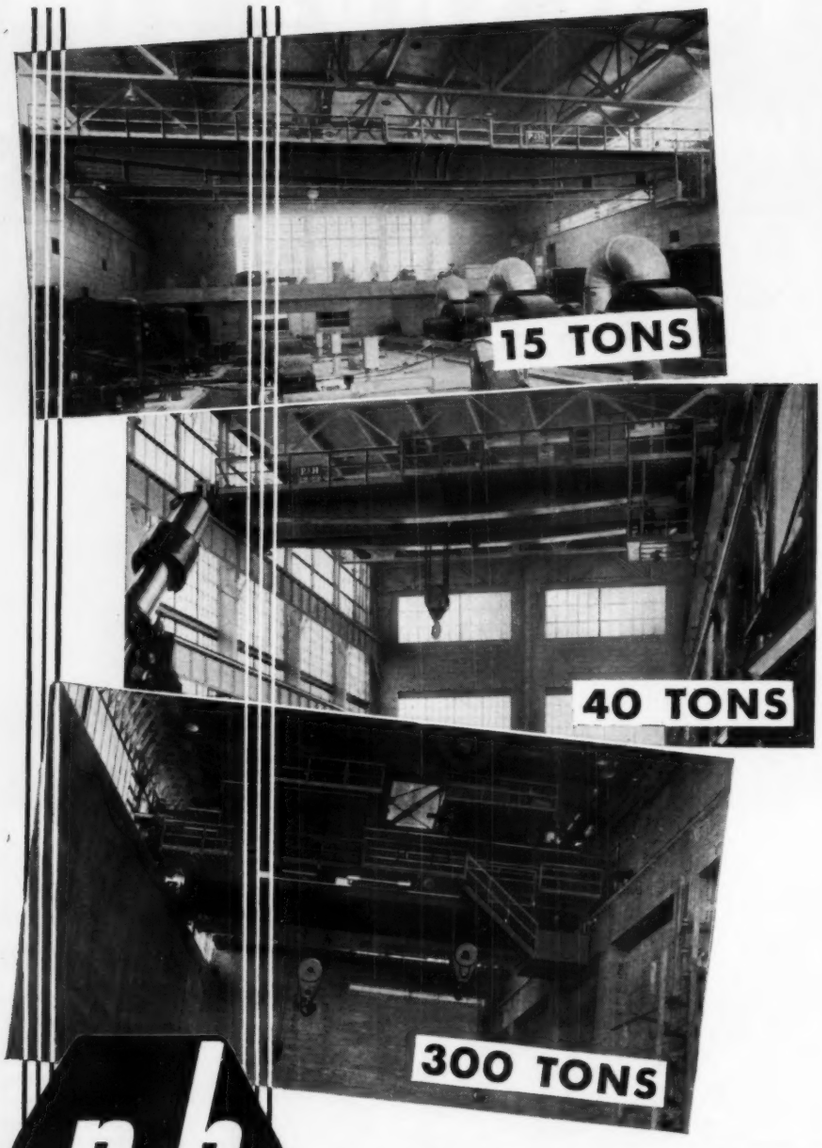
HELPS ASSURE LONG SERVICE LIFE

Production interruptions are avoided and operating time is saved when the motor you buy can stand up under the many adverse operating conditions commonly found in industry Tri-Clad motors meet these conditions with—

1. *Extra Protection* against physical damage
2. *Extra Protection* against electrical breakdown
3. *Extra Protection* against operating wear

GENERAL ELECTRIC

750-81-8058



p&h

ELECTRIC CRANES

Capacities from 5 to 300 Tons

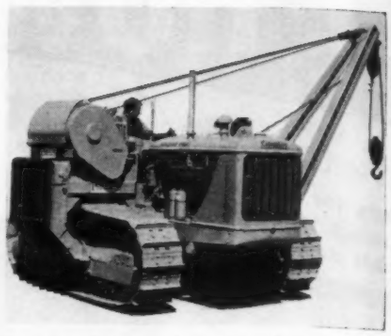
America's oldest and only builder of complete electrical crane equipment.

Whatever your requirements in crane equipment, P&H can answer them with modern designs that assure you of efficient, economical service. Faster operating speeds and easier control enable you to meet the demands of today's increased production schedules.

And P&H's more than 50 years' experience in crane manufacture is your guarantee of recognized quality and performance.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

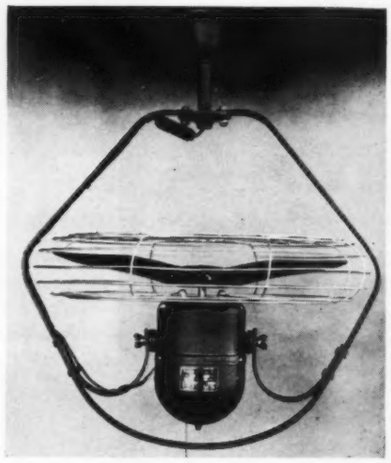
HARNISCHFEGER
CORPORATION
ELECTRIC CRANES • EXCAVATORS • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS



four speeds forward and one in reverse on both drums. Control levers are integral with the winches, convenient to the driver's seat. Trackson Co., Milwaukee.

Heat Circulator

Reco Heat Circulator takes the ceiling heat and the heat pockets that exist over radiators and registers, and circulates it throughout the room. It is a super-power fan that blows the air to the ceiling, then



down the walls and back again, causing complete air circulation in the room and providing uniform temperature. It is claimed that smoke and other odors are dissipated and room is supplied with a constant flow of fresh air without drafts. Reynolds Electric Co., 2650 W. Congress St., Chicago.

Elevator Scaffold and Laddertruck

Safety elevator scaffold and laddertruck keeps the workman standing in the right position to work freely and fast, and always protected by the guard rail. Elevator, which weighs only 25 pounds, hangs securely by two hooks from any rung on the vertical supporting guide ladder, but detaches easily and slides freely.

Vertical ladder is braced to and supported upon the angle iron A frame base, which is mounted on four swiveled rubber-tired casters. The two rear casters lock to travel in either direction and two front ones can be relieved of load for stability by rubber padded lever-operated jacks.

Scaffold weighs about 195 lb.; set up it measures 5 ft. 6 in. wide, is 6 ft. 8 in. long, and 14 ft. 7 in. high; folded down

TO PLANTS *with National Defense* SUB-CONTRACTS

THE DARK DAYS OF FALL AND WINTER BRING NEW HAZARDS TO PRODUCTION SCHEDULES AND PRECISION STANDARDS

Light Up Now to Insure Peak Production!

WILL the coming of dark Fall and Winter Days slow down operations in your plant? Will your workers be hampered by the lack of sufficient lighting for accurate seeing and sustained productive effort? Not if you act now to have Benjamin revamp your lighting system to conform to the higher standards demanded by the urgency of Defense Production.

How Better Lighting Improves Operating Efficiency

Modernizing your lighting system with Benjamin plans and equipment makes your plant independent of fluctuations in daylight; keeps production up to standard even on dark, cloudy days; and insures that all workers in all departments have uniform light at all times of day and night. Modern Benjamin Lighting also insures better utilization of floor space by permitting the most efficient arrangement of machines, benches and assembly lines as they are made independent of daylighting facilities.

Make Sure Your Plant Lighting Meets Both Requirements

The basis of Better Lighting as provided by Benjamin Equipment is MORE LIGHT. Experience demonstrates that employees engaged in Defense Production need from 35 to 75 footcandles to see faster, easier, with greater accuracy and less fatigue . . . to get the job done quicker, better and with less waste of manpower and materials.

Better Lighting also involves providing light of CORRECT QUALITY . . . the light must be evenly distributed over the working surface; must be soft and diffused to minimize *reflected* glare; and the lamps must be adequately shielded to protect the eyes from fatiguing *direct* glare.

To provide such Better Lighting, most economically and efficiently there is a complete range of Benjamin Lighting Equipment comprising many special types of fluorescent, incandescent, mercury vapor, explosion proof and vapor tight fixtures. All are built "like a battleship" with an *extra safety factor* of strength to meet the durability required of industrial lighting equipment for continuous operation and sustained lighting efficiency.

Write Today

for bulletins illustrated at right, containing data and specifications for laying out your lighting system and specifying the proper equipment. Available without cost or obligation, in the solution of your lighting problems, are the services and facilities of the Benjamin Engineering Department.

Preferred Deliveries

Benjamin's entire plant facilities are being concentrated on the production of lighting equipment for Defense needs. Those with Defense Production will have preference on deliveries consistent with priorities regulations.

Warning

Delivery schedules on materials necessary in the construction of lighting equipment are uncertain. Therefore, to insure having your lighting equipment when needed, it is advisable to place your order for lighting equipment as far in advance as possible. Benjamin Electric Mfg. Co., Dept. N, Des Plaines, Illinois.

BENJAMIN
TRADE MARK
WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT
DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

CALL ON BENJAMIN TO SOLVE YOUR DEFENSE PRODUCTION LIGHTING PROBLEMS!

In developing lighting plans and lighting specifications, consult the Benjamin data and specifications shown in the Benjamin Catalog 26 or Benjamin Bulletins on specific types of lighting equipment. For the solution of any special lighting problems you are invited to use, without cost or obligation, the facilities and services of the Benjamin Engineering Department.

MAIL THIS COUPON NOW FOR THESE FREE "LIGHTING BULLETINS"

BENJAMIN ELECTRIC MANUFACTURING COMPANY,
Dept. N, Des Plaines, Illinois
Please send me complete specification data and Bulletins on the type of lighting indicated below.

*Name*_____
*Company*_____
*Street*_____
*City*_____ *State*_____
*Type of Lighting in which interested*_____

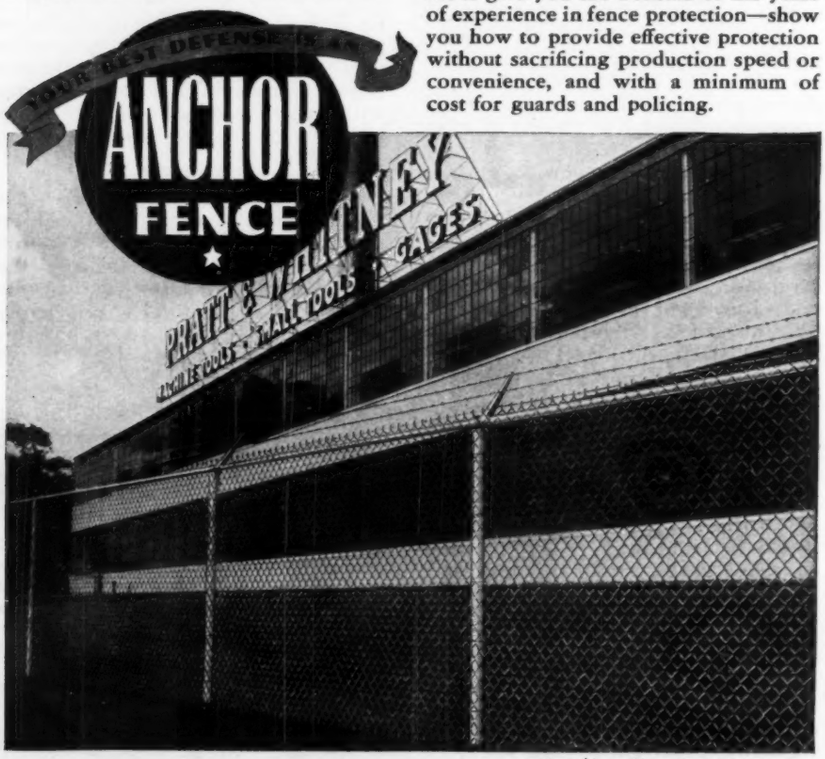
SABOTAGE -- IS FAST BECOMING A PRODUCTION PROBLEM

The Answer is . . . COMPLETE PROTECTION
An Anchor Fence AROUND YOUR PLANT
Anchor Fence Enclosures INSIDE YOUR PLANT

Government Defense Orders are placing an extra burden on industry's shoulders —the problem of protection from delays and losses from sabotage. There are two "musts" to sabotage protection today. First—a penetration-proof Anchor Chain Link fence around your plant to protect your buildings, equipment and personnel from outside sabotage agencies. Second—Anchor Fence enclosures *inside* your plant, around power stations, transformer installations, fuel, chemical and raw material storage to keep all but carefully selected employees away from these vital points.

Anchor Fences can be Moved in case of Plant Expansion

An Anchor Fence can be quickly installed, with our exclusive "drive anchors" which keep it permanently in line in any type soil. It can be moved in case of expansion without loss of posts or fabric. Send for the Anchor Engineer. He'll give you the benefits of his years of experience in fence protection—show you how to provide effective protection without sacrificing production speed or convenience, and with a minimum of cost for guards and policing.



AN ANCHOR FENCE ENGINEER will gladly help you plan complete protection for your plant. Write or wire today to: ANCHOR POST FENCE CO., 6620 Eastern Avenue, Baltimore, Maryland.

NATION-WIDE SALES AND ERECTING SERVICE

for storing or shipping, it is 2 ft. 6 in. wide, 15 ft. long, and 1 ft. 1 in. high. Elevator platform is 17 in. square. R. W. Fieroh Co., Inc., 3401 S. Hoyne Ave., Chicago.

Shut-Off Valves

Automatic shut-off valves for water and air lines are made of Neoprene and brass, without springs, gaskets, washers, or levers of any kind. A short length of hose or Neoprene houses the valve disk and seat, and the entire assembly is threaded onto the end of the hose line. Normal

water pressure, or compressed air, will keep the valve closed. When flow is wanted the operator flexes or bends the end of the hose line. Control is accurate in proportion to the amount it is bent or flexed. Water savers available with ¾-in. and 1-in. thread. Air savers can be furnished in ¼ in., ⅜ in., or ½ in. Davis & Murphy, 500 N. Dearborn St., Chicago.

V-Belt

A V-belt, with driving surface for either flat pulleys or V-grooved pulleys, marketed under the name of "Dayton Cog-Belt," is designed around a cog construction principle on the inner surface of the belt. Provides flexibility and longer belt life when flexing around small pulley diameters, and V-flat belt increases traction by non-skid design. Manufactured in all standard lengths in A. B, C, D, and E cross-sections, and in matched sets for multiple drive service. The Dayton Rubber Mfg. Co., Dayton, Ohio.

Dust Collector System

Rapidity of installation, compactness, and long life as a result of low motor speeds are features claimed for a self-contained

PARLON HAS BEEN DRAFTED

To Help Protect Defense Production

IF YOU are producing defense materials for whose quality it is desirable that ceilings, floors, and walls of manufacturing areas be *kept from dusting*, then *you* need lustrous, hard PARLON-base paints that *stay on*. In ordering from your paint supplier, send your priority certificate with your purchase order.

Paints made with a PARLON base have proved the answer to many a production man's prayer. PARLON is completely and absolutely unaffected by the usual paint-destructive combination of alkalies and moisture. PARLON-base paints can be applied to concrete soon after the forms have been knocked off. These paints dry with almost the speed of lacquer, forming a glossy finish that has amazing resistance. Quality paint manufacturers are producing PARLON-base paints in a variety of colors, and in formulations tailored to meet a range of conditions.

We hope that the cause of present sales restrictions will soon be eliminated, so that adequate supplies of PARLON-base paints may again be made available by paint manufacturers for *all* industry.

Have you our literature giving full information about this remarkable new paint development?

PARLON

★ ★ ★ ★ ★ ★ ★ ★ ★

CELLULOSE PRODUCTS DEPARTMENT

HERCULES POWDER COMPANY

INCORPORATED

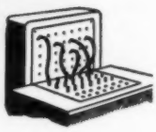
905 MARKET STREET • WILMINGTON • DELAWARE

GGG-39

THEY'V[illegible] TO THE AMERICAN Plus!

You, too, can cut assembly time and costs up to 50% by switching to American PLUS Phillips Screws

"After considerable experimentation to find the proper type screw, we selected American PLUS Phillips Screws. They most adequately fulfill our requirements for both quality and manufacturing economy."
—Hygrade Sylvania Corp.



ALL TYPES OF EQUIPMENT ASSEMBLED FASTER . . . MORE SECURELY

Most everybody knows American PLUS Phillips Screws are widely used on automobiles and aircraft. Illustrated are a few of hundreds of products whose manufacturers say fast-driving, non-slipping, tight-seating American PLUS Phillips Screws save 50% in assembly cost. Send for free folders listed below.*

Genuine Phillips recess . . . The PLUS on the Screw Means Less Cost to You

Write "American PLUS" in front of "Phillips" on your orders and benefit from

1. engineering service based on the longest and broadest experience with Phillips
2. piece inspection insuring full quality, full count
3. prompt shipment from largest stocks.

There is an American PLUS Phillips Distributor in Your Vicinity

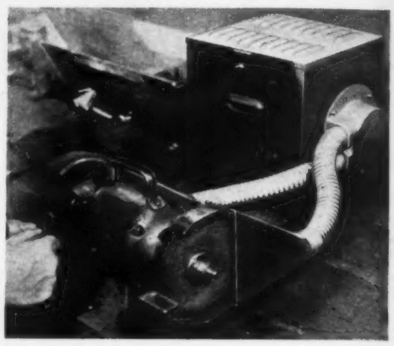
AMERICAN SCREW COMPANY

Chicago, Ill. 589 E. Illinois St. | Providence, R. I. | Detroit, Mich. 1847 W. Bethune St.

*WOOD SCREWS *MACHINE SCREWS *SHEET METAL SCREWS *STOVE BOLTS

U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

portable, industrial type dust collector. Dustkop Model PM 100 is furnished with flexible metal hose and two exhaust intake hoods capable of being quickly attached to almost any portable type bench grinder. Unit takes up approximately 1 square foot of space, employs a 1/6 hp., 110 volt, split-phase motor to develop over 260 cu.ft. per min. air intake capacity.



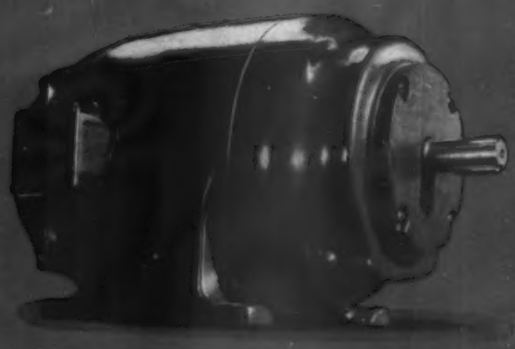
Assembly and installation require no tools. Flexible metal hose permits installation of wheel hoods at most desirable angle with respect to wheel and present guard. Hoods can be fastened (bolted or screwed) to guards if desired.

In operation, dust-laden air from grinder wheels goes through intake hose and into intake flange, and is drawn through the sirocco type wheel to be discharged through the horizontally placed spun-glass filter. Dust drops back into the removable pan. Aget-Detroit Mfg. Co., 966 Book Bldg., Detroit.

Primary Fuse Cutouts

For use on a.c. circuits up to 12,500 volts where fuse requirements do not exceed 50 amperes, a primary fuse cutout known as Type EA is housed with porce-

lain that has high dielectric properties and is moisture proof. All contacts are coated with silver to assure low contact drop, and fuse tube is made of fiber lined duck Micarta that is moisture resisting. The toggle mechanism provides drop-out action of the door to indicate a



SPLASH PROOF

Complete protection from splashing liquids . . . especially suited for dairies, breweries, chemical process industries, food plants, etc.

TOTALLY ENCLOSED

Non-ventilated type . . . smooth frame motors . . . for use in presence of dust, dirt or foreign material.

MASTER

Protected Type Motors

When you must use motors under adverse operating conditions, select one of Master's Protected Type Motors. They are available in sizes from 1/8 to 75 horsepower in a wide variety of electrical and mechanical modifications. Investigate MASTER'S usual ability to serve you promptly and economically with motors that really fit your exact needs.

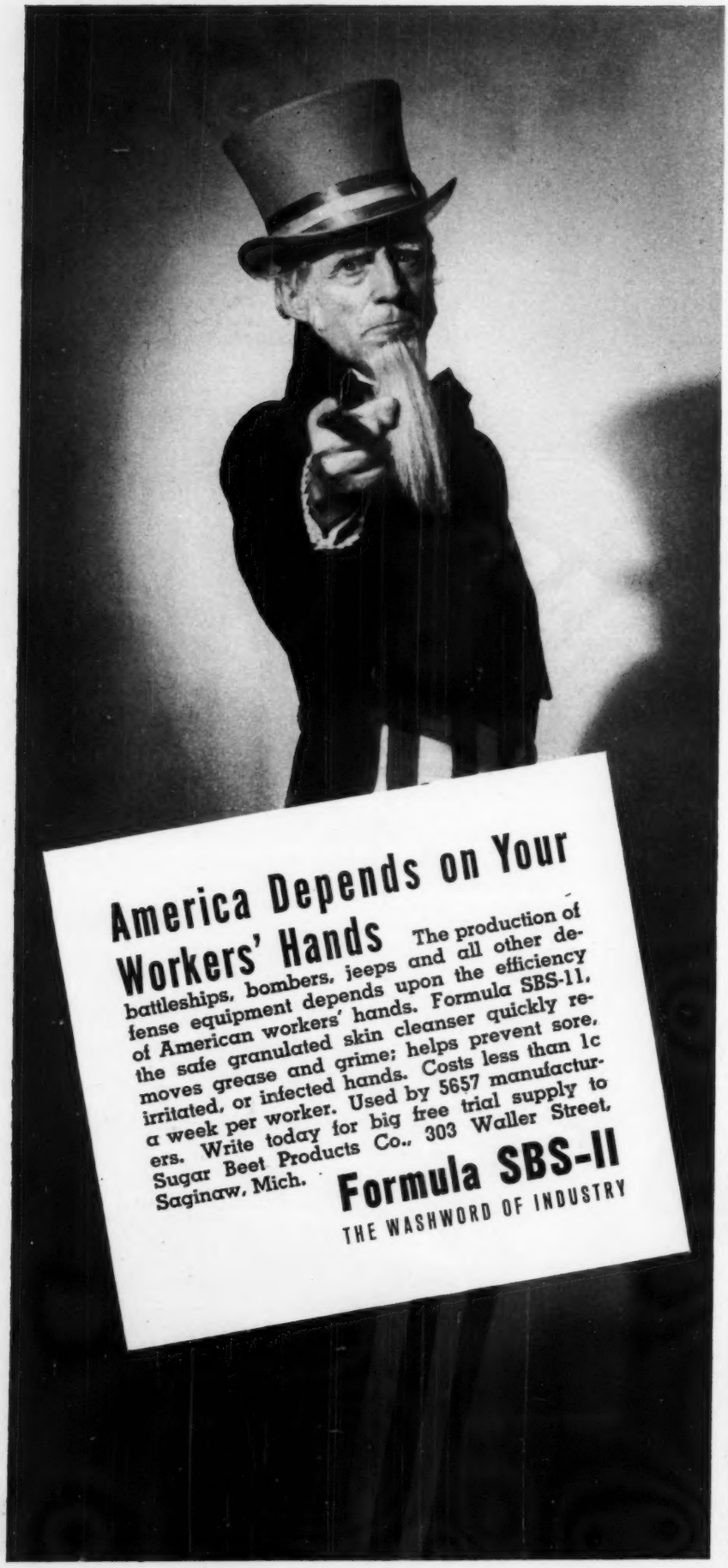
THE MASTER ELECTRIC COMPANY
DAYTON OHIO

FAN COOLED

Totally enclosed motor with external fan cooling saves space. Ideal for all applications where there are excessive amounts of dust or dirt.

EXPLOSION PROOF

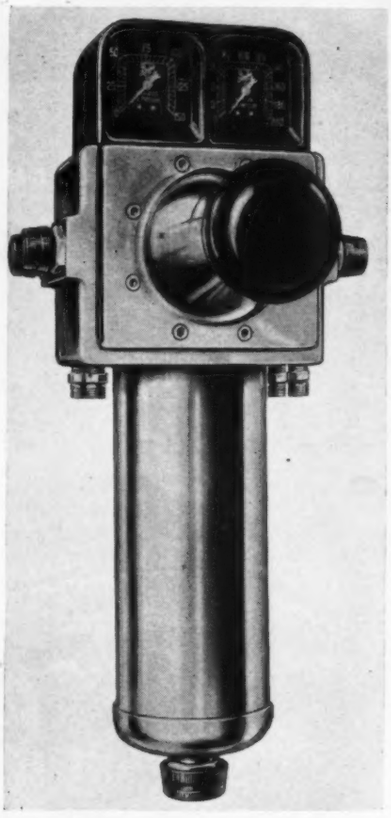
Underwriters approved for operation in the presence of explosive gasses or explosive dusts . . . full protection on such hazardous applications.


America Depends on Your Workers' Hands
The production of battleships, bombers, jeeps and all other defense equipment depends upon the efficiency of American workers' hands. Formula SBS-11, the safe granulated skin cleanser quickly removes grease and grime; helps prevent sore, irritated, or infected hands. Costs less than 1c a week per worker. Used by 5657 manufacturers. Write today for big free trial supply to Sugar Beet Products Co., 303 Waller Street, Saginaw, Mich.
Formula SBS-II
THE WASHWORD OF INDUSTRY

blown fuse. Line leads can be inserted easily. Any size stranded wire from the smallest to zero solid or No. 1 stranded can be inserted and held by two 5/16-in. screws. All live parts are totally inclosed. Door is easily removed and inserted by any standard hookstick. In fuse replacement this enables the operation to be made from a safe distance. Same fuse holder, fuse tube, fuse door, and disconnect blade are used on the 5 kv. and 7.5/12.5 kv. cutouts. Westinghouse Elec. & Mfg. Co., East Pittsburgh.

Oil and Water Extractor

Large capacity oil and water extractor, known as Binks E-75, has a rated capacity of 75 c.f.m., at 60 to 70-lb. pressure, and has two main line air outlets, as well as two regulated air outlets. Air cleaning



principle, with efficient metal filter, cleans but does not impair the free flow of air. More uniform air pressure, due to a newly designed large capacity air regulator is claimed. Binks Manufacturing Co., 3114-40 Carroll Ave., Chicago.

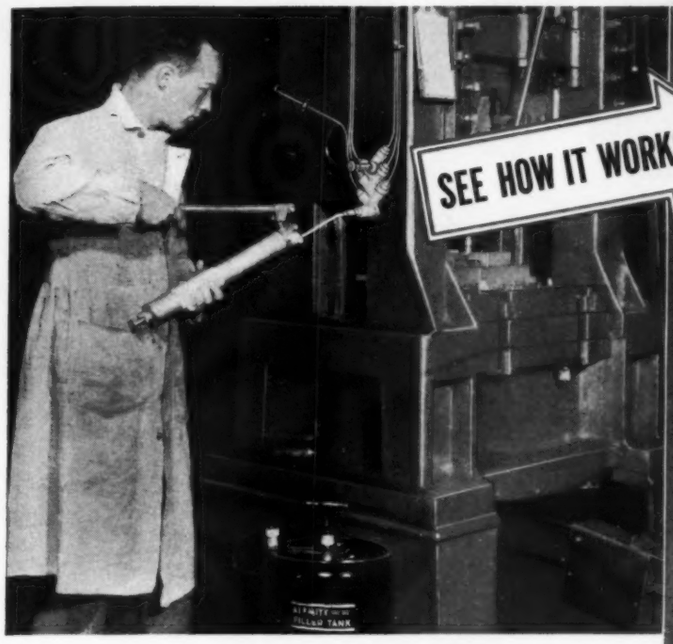
Floodlight

No. 90 Diffuso Floodlight is made with reverse curves formed from one piece of metal, without seams of any kind. Designed for use with lamps of from 750 to 1,500 watts, it provides a uniform flood of light over large areas, for purposes such as protection of industrial properties, parking spaces, or athletic fields. Made of rust-resisting iron, covered with three coats of vitreous-fired porcelain enamel with white reflecting surface, finish is permanent and easy to clean. Installation and

Don't let Lubrication Delay Production!

NEW ALEMITE CENTRALIZED LUBRICATING SYSTEM

SERVICES BEARINGS WHILE MACHINES ARE IN OPERATION!

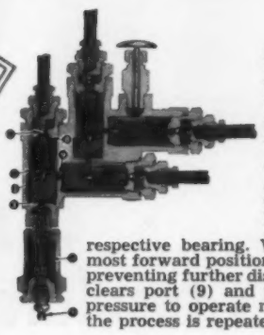


Delivers Pre-determined Quantity of Grease to Each Bearing—Signals When Lubrication is Completed

ALL INDUSTRY is feeling the emergency demand for stepped-up production! Machines and men are being taxed *to the limits of endurance.* Under such conditions it becomes vitally important to make every man-hour, every machine-hour show maximum results in terms of finished products. And positive, dependable lubrication *becomes an absolute "must"!*

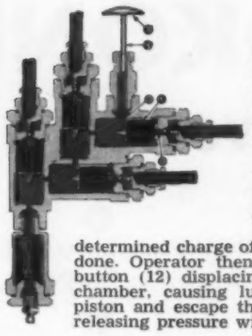
The Alemite Progressive Lubricating System insures dependable, positive pressure lubrication. It speeds lubrication. It promotes safety by bringing remote bearings into easy reach. *It permits lubrication while machinery is in operation,* saving machine-hours and man-hours and increasing output. It may be serviced from one central point by either a power or manually-operated grease gun.

From the standpoint of *saved production time alone,* this system deserves your immediate investigation. Economies resulting from its use soon cover the original cost. The system is inexpensive, easy to install. Write for complete facts!



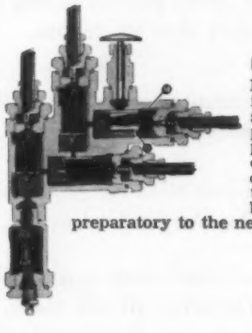
DISCHARGING

Lubricant enters through fitting (1) and is filtered thru strainer (2). Pressure forces valve (3) from seat on intake port (4) moving piston forward (5). Lubricant ahead of piston forces open valve (6) permitting grease to pass into lubricant line (7) and its respective bearing. When piston reaches its most forward position it seats and seals (at 8) preventing further discharge of lubricant. This clears port (9) and permits lubricant under pressure to operate next valve in series, and the process is repeated.



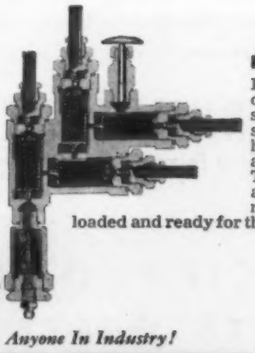
DISCHARGED

The system is shown in its fully discharged position. At this point the last piston (5) clears indicator port (10) allowing lubricant to enter under indicator shaft (11) and moving it to outward position, signalling the operator that all bearings have received their predetermined charge of lubricant and the job is done. Operator then pushes down indicator button (12) displacing lubricant in indicator chamber, causing lubricant to by-pass last piston and escape thru milled slot (13) thus releasing pressure within the system.



RELOADING

Release of pressure within the system permits the springs (14) to return the pistons to their original positions. The lubricant displaced by the return of the piston by-passes thru groove (15) to chamber ahead of the piston, preparatory to the next lubrication.



RELOADED

In this illustration the original position of the system is shown. The self-aligning valves are held in a seated position against the intake ports. The outlet check valves are closed. The system is not under pressure. It is loaded and ready for the next lubrication cycle.

Ask Anyone In Industry!

ALEMITE
REG. U.S. PAT. OFF.
Industrial LUBRICATION
ANOTHER STEWART-WARNER PRODUCT

1870 Diversey Parkway, Chicago, Illinois • Belleville, Ontario

ONLY
Cables Insulated with
OKONITE
Give You All 4

❶ Long-lived insulation made with the world's finest rubber — wild up-river fine Para.

❷ Conductors better protected from corrosion by an Okoloy coating over the copper.

❸ Perfect centering of conductors by the Okonite strip-insulating process.

❹ Mold-cured insulation for greater density, uniformity and higher electrical values.

Okonite insulated wires and cables provide these important features in all sizes, types and constructions. Let our Engineering Service Department suggest the design best suited for the individual requirements of your plant.

THE OKONITE COMPANY
PASSAIC, NEW JERSEY
Offices in principal cities

OKONITE

SPECIFY OKONITE
INSULATED WIRES & CABLES

servicing are facilitated by rustproof ventilated hood that permits quick attachment or removal as well as complete lateral and vertical positioning. Available with either pole or bracket mounting; both styles are weatherproof. Goodrich Electric Co., 4600 Belle Plaine Ave., Chicago.

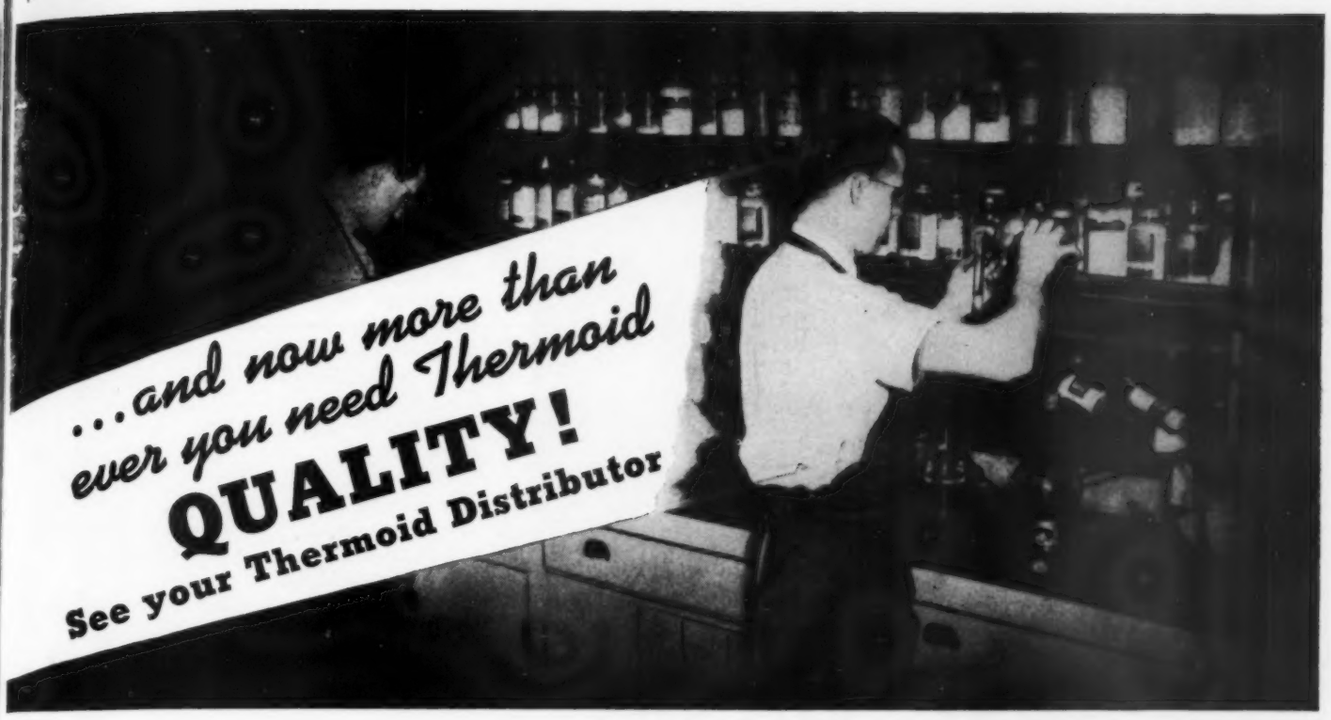
A.C. Arc Welder

A-C arc welder, suitable for all types of industrial services, is designed to give, in 30 different steps, practically any welding current required between 15 and 250 amperes. The low heat ranges make it possible to weld light gage metal without danger of burning holes, while the high heats permit the welding of heavy parts. Welder has passed the 8-hour burn-

out test of the National Board of Fire Underwriters. This test is made with transformer short-circuited and machine in continuous operation for 8 hours at the maximum rate. Welder construction is oversize and extra heavy. It is equipped with swivel casters and is therefore portable and easy to handle. Standard equipment includes 20 ft. of a.c. cable, 20 ft. of ground cable, 20 ft. of electrode cable, and one electrode holder. Hand shields, head shield, helmet lens, extra electrode holders, etc., can be furnished. Allen Electric & Equipment Company, 1044 N. Pitcher St., Kalamazoo, Michigan.

Explosion Proof Wax Tank

Electric explosion-proof wax tank, of strong steel construction, with hinged cover, is for insulating coils and parts by dipping. Furnished in black enamel, and insulated against heat loss. Inside dimensions are 36 in. x 20 in. and 14 in. deep with an over-all height of 30 in. Automatically controlled heat is supplied by flat units fastened to the bottom and lower portion of the sides. By distributing the applied heat over a large surface, the wattage density is low enough to prevent carbonizing of the wax. A 1-in. drain-out cock is provided at one end. Mounted on the other end is an oil-filled explosion-proof container housing the thermostat, and an on-and-off switch. Thermostat bulb, in a protecting tube, is brazed to the inside bottom surface. Vulcan Electric Co., 600 Broad St., Lynn, Mass.



When you want equipment today, you want it quick.

Even more, it must be *good*. This is no time to take risks with products of questionable quality.

You can count on quality when you do business with Thermoid. *Top* quality. It's the first consideration in every Thermoid Product—belts, hose, friction materials.

Quality in raw materials—the best available. Quality in design—based on creative ability and on the practical experience gained in thousands of successful, widely varied installations. Quality in manufacturing equipment—the best to be had. And quality in workmanship, to assure the finest performance in the finished product.

This product quality is another important reason why it's good business to call on your Thermoid Distributor every time.

THERMOID'S LINE INCLUDES:

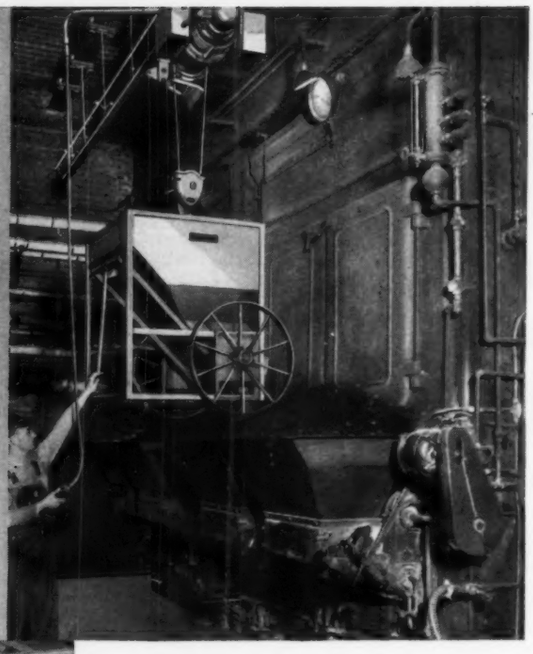
Complete V-Belt Drives
Flat Transmission Belting
Conveyor Belting
Elevator Belting
Wrapped and Molded Hose
Sheet and Rod Packings
Industrial Brake Linings and Friction Products
Rubber Covered Rolls
Pulley Lagging

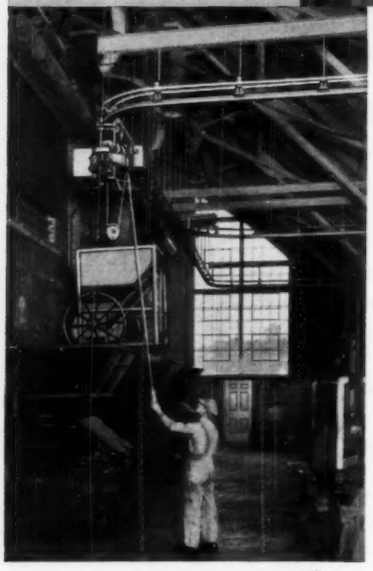
THERMOID'S NEW V-BELT DRIVE DATA BOOK!

Thermoid offers a complete V-Belt Drive Service—both belts and sheaves—to cover every possible application, from the smallest F.H.P. drive to the largest multiple-belt installation. With Thermoid's new 80-page V-Belt Drive Data Book, you will find it easy to select correctly engineered Thermoid Drives. Be sure to get your copy of this Data Book. See how thoroughly it covers the subject—how simple it is to use.

★ Thermoid ★
RUBBER
DIVISION OF THERMOID CO.—TRENTON, N. J.

COAL HANDLING IN THE BOILER ROOM





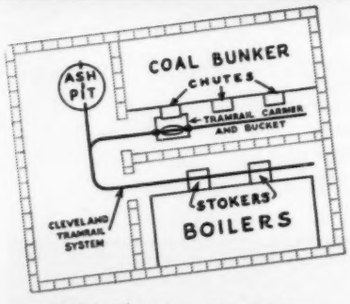
HAUL BOTH COAL and ASHES the EASY TRAMRAIL WAY

With a Cleveland Tramrail system it is an easy task to keep the stoker hoppers filled and ashes cleaned away in good order. Small and medium size power and heating plants can be taken care of by one man.

A typical boiler room installation is shown in the sketch. A Cleveland Tramrail bucket is rolled under one of the three discharge chutes of the coal bunker and filled. The bucket is then picked up by the carrier unit and conveyed to the stoker hoppers where coal is dumped in such amounts as desired.

The ashes are loaded into ash buckets, picked up by the hoist and either stored in the pit or hoisted to waiting trucks and hauled away.

Many installations for handling coal and ashes have been installed by Cleveland Tramrail, for either hand or electric operation. Scales of several types have been adapted to assist in keeping accurate records.



COAL direct from bin to boiler
ASHES direct to pit or truck

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1187 East 283rd St. Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

We Can Do Defense Work

(*Continued from page 61*)

working two 8-hour shifts; all others, one 8-hour shift. That, with present equipment on one shift 145 workers could be employed; two shifts, 290; three shifts, 435. That three 8-hour shifts could be worked with available labor. That there is an efficient and well-equipped designing and engineering department.

Follows a complete list of machines by name, size, type, manufacturer, and idle hours per day. A recapitulation of idle machine hours shows 40 hours weekly for welding equipment, 40 for cartridge-assembly equipment, 80 for all other machines. Power source is Narragansett Electric Company, is adequate. Shipping facilities include the New Haven Railroad, boat from Providence harbor, all major New England trucking lines.

The list of regular important customers includes Ford, Studebaker, Mack, Diamond T, Firestone, Wright Aeronautical.

Defense Orders?

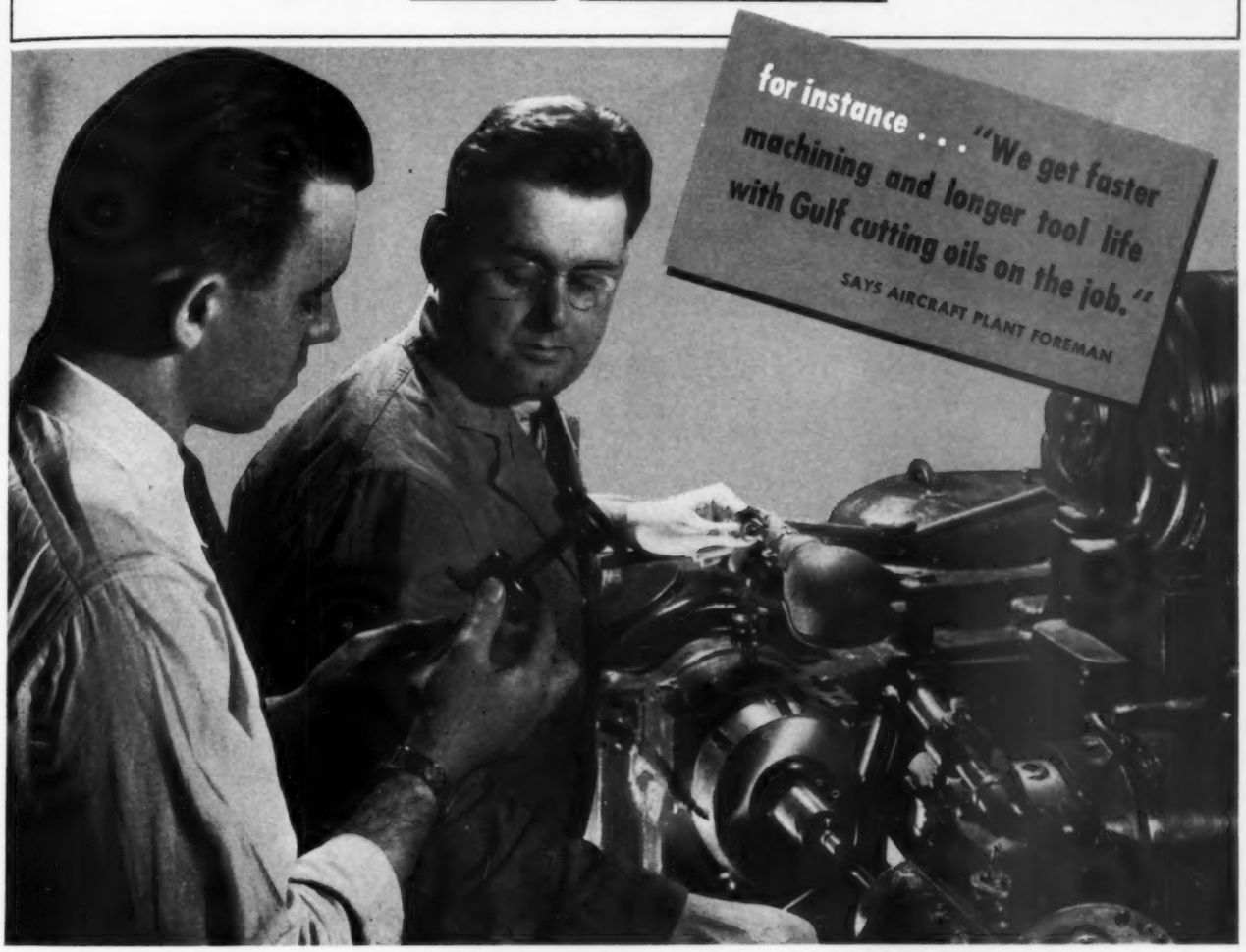
Has it defense orders? Yes, for oil filters. It has subcontracted for Hercules Motor Corporation, Ford, Wright, Continental Motors, and others. It has subcontracted to Bellevue, Mason, Larson Tool & Stamping (Attleboro, Mass.), Weatherhead Company (Cleveland), Dole Valve Company (Chicago), Flex-O-Tube Company (Detroit), and others.

Several pages of photographs show such equipment as projection welders, spot welders, infra-red drying oven, lathes, screw machines. Also views of laboratory and production departments. A catalog is included, for obvious reasons.

The same procedure was followed in listing the production facilities of the other eight plants. It has been described here in considerable detail so that any other plant or group of plants may see how simply such a job can be done. A sample page from the book shows part of the list of 70 machines in one of the cooperating plants.

Result? OPM looked at the book, pronounced it one of the most practical presentations yet made by a manufacturer or group. Working with the Boston office of the Defense Contract Service and Colonel Crawford of the Boston Ordnance Office, Fram was given the opportunity to submit bids on a product of its own choosing.

"Better protection with GULF QUALITY LUBRICANTS means more production"... SAY PLANT MEN



"Thanks to the remarkable stability and endurance of Gulf Lubricants, we can safely keep our equipment operating continuously and with peak loads"...

THE *production value* of Gulf quality lubricants shows up today—when capacity operation means a "knock-down and drag-out" fight with friction. For severe service proves the remarkable stability and endurance of these lubricants—they stand up and give *full protection* under continuous peak-load conditions — conditions which often cause breakdowns or disruptions in production schedules. Result: *More output* from Gulf-lubricated equipment.

If you have a feeling of unconfirmed satisfaction with the operation of your equipment—perhaps improvement is possible. Investigate—ask a Gulf engineer to recommend improved lubrication. He never needs to compromise in the selection of lubricants, for there is the right Gulf product for every type of equipment and for every operating condition—more than 400 quality oils and greases are included in the Gulf line. They are quickly available to you through 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION · GULF REFINING COMPANY · PITTSBURGH, PA.

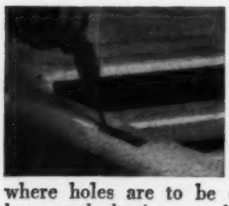
HOW SCOTCH *Adhesive* TAPES SAVE TIME AND MONEY IN PACKING, PRODUCT FINISHING *and in other* INDUSTRIAL USAGES

Mask Two-Tone Jobs

Scotch Masking Tape gives complete protection when used during painting operations—it will not lift under spray pressure—easily removed. Color separation is clean and sharp.

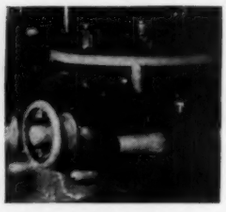
For Touch-Up Work

Make a protective mask with Scotch Masking Tape—it's quick and easy. Then spray and remove mask. This tape has a thin but strong flexible backing—ideal for straight or curved masking.



When Drilling Holes Protect the Finish

Apply strips of Scotch Adhesive Tape over area where holes are to be drilled to prevent hot metal shavings or drill jig from marring the finish.

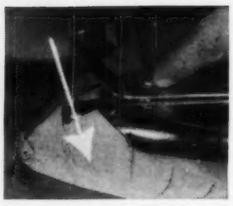


Protect Machinery Parts

When preparing machinery for painting or shipping, the dependable way to protect highly finished parts is with Scotch Masking Tape. The flexible, strong backing insures complete protection. Tape is easily removed.

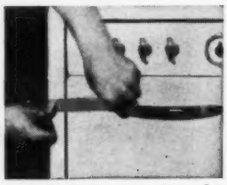
Eliminate Spatter Marks

Prevent marring from spatter marks when electric welding stainless steel. Apply a paper mask held in place with Scotch Masking Tape on side of seam to be welded. Scotch Tape is pressure sensitive—easily applied without moistening. Requires no special equipment.



Protect Polished Surfaces

Apply a strip of Scotch Adhesive Tape to chrome, nickel or enamel surface. This is a sure way to protect surfaces against mars while being handled during assembly, storage and shipment.



Hold Stove Doors and Coverall Tops In Place During Shipment

Doors, drawers, tops, loose parts can be held firmly in place from factory to dealer stockroom by using Scotch Adhesive Tape. Also used to fasten packing materials securely in position.

Hold Wrapping Material Securely

Strong backing, correct adhesive tack and flexibility of Scotch Adhesive Tapes assure a securely wrapped package for an indefinite period.

For Sealing Containers

Scotch Adhesive Tapes assure a strong, airtight seal for containers of all kinds of merchandise. Flexible and easy to apply—adhere securely with slight pressure.

Made and Patented in U. S. A. by

MINNESOTA MINING & MFG. CO.

SAINT PAUL MINNESOTA

Canadian Manufacturers and Distributors

CANADIAN DUREX ABRASIVES, LTD., 154 Pearl St., Toronto, Can.

FMM 1141

Gentlemen:
Kindly send sample roll of Scotch Adhesive Tape for the following purpose: .....

Name .....

Address .....

City ..... State .....

The product chosen is a bomb fuse. As this article is written (October 10), the contract has not been awarded because of last-minute changes in specifications. Meanwhile Fram has discovered it advisable to supplement the facilities of its own plants and those of cooperating companies with others. By noising the idea around it has had inquiries from some 50 concerns, and has been able to compile a list of 26 plants all anxious and able to collaborate once Fram gets the contract.

Is it possible to accept an order on this basis, subcontract most of the work, and end up with anything like the price the company can make that does the whole job? Wilson says yes. Look at the automobile industry, he points out. It's set up on much the same basis, subcontracts a large percentage of its work to specialists, and can never be accused of not giving the public its money's worth.

Cut Costs Later

"Give us the contract," says Wilson, a forthright fellow who never minces his words. "Give us the contract. We'll make the best price we can. Later, when we can beat the price, we'll cut it. Because after we get going for a while we'll cut the hell out of costs!"

What this country needs right now, far more than the proverbial nickel cigar of superior quality, is a flock of mother-hen Frams working on a flock of defense orders. The individual plant in industry can help to bring about a consummation so devoutly wished by making the same kind of study and the same volume of noise about its production facilities that this particular company has made. Looks from here like the first long stride down to that big jump from butter to guns.

Let's Put Closed Shop on Ice Until—

(*Continued from page 63*)

As a result, the leaders, freed from further need of serving the membership, hastened to give their time mostly to politics. They rose fast. Nobody dared utter a word against their fitness as either leader or candidate. To do so was to risk both local and nation-wide "exclusion." In a country so lacking prosperous factories, such exclusion came close to spelling starvation! So the union leaders were enabled to bring peace and stability to the local plant while they rose to such power in and over the

Now Available
RLM SPECIFICATION and CERTIFICATION FOR *Eight Types* OF INDUSTRIAL *Fluorescent* LIGHTING UNITS

1. Specification No. 5: 48" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit
2. Specification No. 6: 48" Fluorescent Three-Lamp Closed-End Porcelain Enamel Unit
3. Specification No. 7: 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit
4. Specification No. 8: 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Diffuser Unit
5. Specification No. 9: 48" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit
6. Specification No. 10: 48" Fluorescent Three-Lamp Open-End Porcelain Enamel Unit
7. Specification No. 11: 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit
8. Specification No. 12: 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Diffuser Unit

Write for Copies of these Specifications

FIRST *in* PERFORMANCE

RLM CERTIFIED INDUSTRIAL *Fluorescent* LIGHTING UNITS

Engineered for Operation with **MAZDA** *Fluorescent Lamps*

● You can recommend RLM-labeled Fluorescent Lighting Fixtures with confidence that they will deliver maximum value in lighting efficiency and economy.

This label is the user's warranty that the unit to which it is affixed has been manufactured in compliance with quality-assuring specifications under the exacting procedure developed and administered by RLM Standards Institute. It certifies that the fixture, auxiliary control equipment, sockets and other component parts are properly engineered for co-ordinated operation with Mazda Fluorescent Lamps . . . that the fixture is identical to samples certified by Electrical Testing Laboratories under a rigid and continuous inspecting system at the factory of the manufacturer.

The RLM Industrial Fluorescent Lighting Fixture Specifications listed above were developed by RLM Standards Institute—a non-profit organization operated to develop and promulgate standard specifications for the efficient performance of industrial lighting equipment. *Copies are available on request.*

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. MICHIGAN AVE. • SUITE 1600 • CHICAGO, ILL.

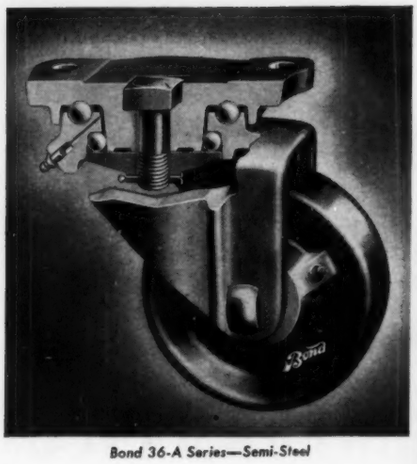
Guarantee

All RLM certified fluorescent lighting units are guaranteed against mechanical and electrical defects for a period of ninety (90) days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or its distributor.

RLM certified fluorescent lighting units are engineered for operation with Mazda fluorescent lamps to give maximum light output and trouble-free operation when properly installed and under normal conditions of use

A football star would get little distance in his punts if he wore wrestling shoes. His shoes must be built for the job...

Casters, too, must be built for the job



Bond 36-A Series—Semi-Steel

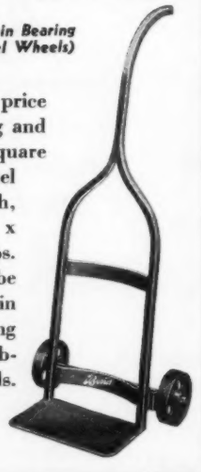
Bond 40-A Series—All Steel

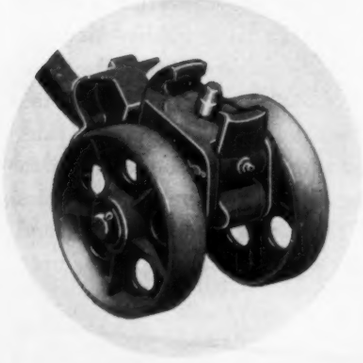
EXTRA-STURDY construction of Bond Truck Casters moves extra tons during their longer life. Both casters illustrated swivel easily. Their specially designed ball races promote smooth rolling and absorb shock. Bond *built-for-the-job* efficiency keeps production moving ... no delays due to broken or prematurely worn casters. Fit your casters to the job by consulting the new Bond Data Book, K-34. Write for your free copy today.

BOND KEG AND CASE TRUCK

$5.60 *(with Plain Bearing Semi-Steel Wheels)*
LIST

Exceptionally low price for well built keg and case truck. 1" square high-carbon steel tubing. Length, 46". Nose, 14" x 7". Weight, 30 lbs. Wheels, 6". Can be equipped with Plain or Roller Bearing Semi-Steel or Rubber Tread Wheels. Write for free folder, R-35.





BOND LIFT JACK EQUIPMENT

Install the time saving ... labor saving ... Bond Lift Jack-Platform method. It gives peak efficiency in materials handling ... and requires a minimum of equipment. Send for bulletin R-33 showing both Standard and DeLuxe Jacks.

Bond
REG U.S. PAT. OFF.

TRUCK CASTERS
LIFT JACKS
KEG & CASE TRUCKS

BOND FOUNDRY & MACHINE COMPANY, MANHEIM, PA.

federal government in Mexico City as soon brought stagnation to the entire industry—the complete stagnation of expropriation.

"Beatings and sluggings," said another worker in another city where a union black list had not yet been imagined, "are indulged in much too often by the racketeers in one camp and by the reds in the other, to make me want to allow them the closed shop."

Nuts and Raisins

"If I were a worker," a frank leader recently confided to an employer, "I'd call closed shop poison. But since I'm an organizer, I find it nuts and raisins!"

"No closed shop contract," said a coal operator lately, "without a penalty clause is worth a damn! With us, 'wild-cat' or 'illegal' strikers have long been penalized $1 each per strike day. That used to bring some measure of your 'peace and stability.' Not now! Men earning $8 per day and more are too willing to pay a dollar a day for the satisfaction of raising hell whenever they feel like it!"

The same operator would pretty surely be the first to agree that closed shop and check-off, favoring as it has other fuels by its constant upping of coal wages and costs, had brought to his industry a goodly measure of political control and stagnation.

Out of the mouths of wage earners and leaders as well as of managers can be heard, I submit, enough words fully to convince anyone that the defense emergency should not be utilized to establish a permanent closed shop and check-off in America—that, instead, final decision regarding it should be postponed, first, until the emergency is over and, second, until unions and their leaders be made or become more responsible.

Such postponement should, without fail, permit no effort to undermine unionism. If anything it should, if possible, be made in a manner calculated to make even more certain that "union security" which so constantly, and so understandably if not always so properly, worries the leaders. But more than a few of labor's officers here and abroad stand ready to agree that, as long as laws which give can also take away, unionism can never be genuinely and permanently secure until its leaders are somehow forced or persuaded to assume more responsibility to members, employers, customers, and public.

The heads of both British government and British labor have pretty surely thought more deeply than we about this matter of union security. There the legislators have made "po-

HERE'S HOW TO GET GREATER OUTPUT FROM POWER-PLANT EQUIPMENT ...AT LOWER COST

PARTIAL LIST OF J-M INSULATIONS

For steam lines up to 600° F.
J-M 85% Magnesia Pipe Insulation

For boiler surfaces to 600° F.
J-M 85% Magnesia Blocks

For cold rooms, ducts and refrigerating equipment
Rock Cork Sheets

For refrigerated piping
Rock Cork Pipe Insulation

For cold-water lines
Anti-Sweat Pipe Insulation

For hot or cold service-water lines
Pre-Shrunk Wool Felt Pipe Insulation

For low-pressure steam lines
Pre-Shrunk Asbestocel Pipe Insulation

For steam lines to 700° F.
Asbesto-Sponge Felted Pipe Insulation

For superheated steam lines
Superex-Magnesia Combination Insulation

For furnace insulation
Superex Blocks, Insulating Brick (3 types), Insulating Fire Brick (4 types), Sil-O-Cel C-3 Concrete

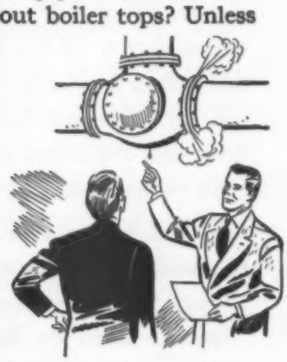
Other insulations for special requirements

Even though your power-plant equipment is pushed far beyond its normal rating and is operating at greater capacity than ever before—here's how you may get even larger returns from every ton of fuel you burn.

Check up on your insulation!

There's a good chance that a careful investigation today may reveal unsuspected sources of wasted heat—lost efficiency—that heretofore have gone unnoticed, or unattended, yet which, when corrected, may materially increase the output of your plant.

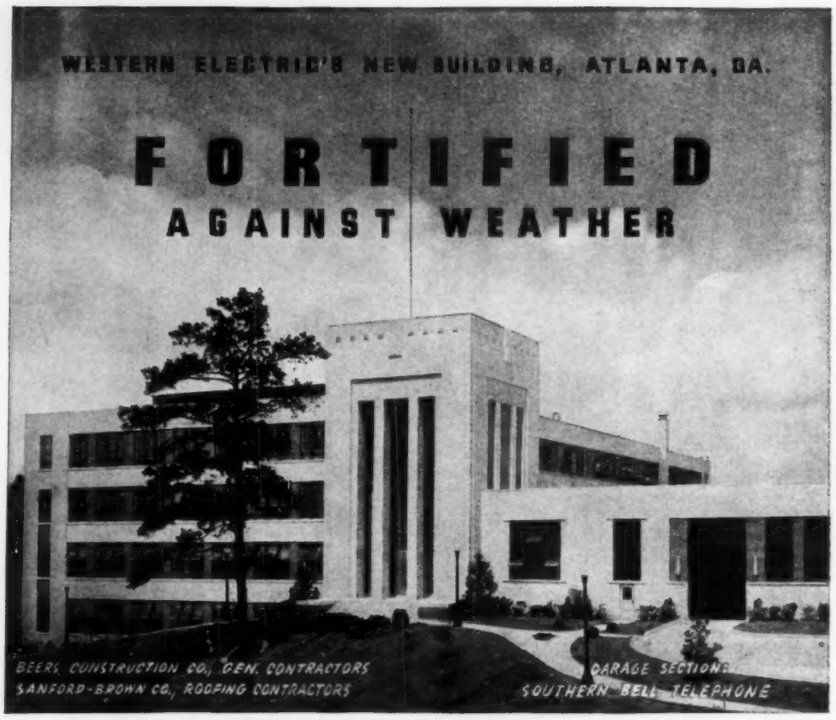
For example: Are all the flanges and fittings in your steam lines fully insulated? Are gaskets sound and tight? A leak here may allow moisture to creep under the pipe insulation and greatly decrease its efficiency. How about boiler tops? Unless the insulation is in good condition, you are losing heat, wasting fuel. If any of your equipment is exposed to weather, make sure the weatherproofing has not loosened and left the insulation unprotected.



These are just a few of the potential sources of wasted fuel and lost efficiency that may exist in any power plant. To make sure that you catch every one, and stop the trouble before it goes too far, Johns-Manville offers you, without charge, the services of a trained, experienced insulation engineer. For full details on this helpful service, and for facts on the complete Johns-Manville line of power-plant insulations, write Johns-Manville, 22 E. 40th St., New York, N. Y.

Johns-Manville INDUSTRIAL INSULATIONS

FOR EVERY TEMPERATURE...EVERY SERVICE CONDITION



WITH A Carey BUILT-UP ROOF

To make sure of unfailing protection, Western Electric topped its new Atlanta building with a CAREY Built-Up Roof.

After all, there's no need for any buyer of an industrial roof to take a chance—not when CAREY will build the roof and guarantee up to 20 years of expense-free service. In the construction of a CAREY Roof, chance is ruled out. All the factors that affect roof life—extremes of temperature, presence of salt air, chemical fumes, vibration—these and other conditions are appraised in the light of experience and the roof built to meet the requirements.

For roof safety and low yearly cost, capitalize CAREY'S 68 years of manufacturing experience. A nationwide organization is at your service. Write today for our book, "Specifications for Bonded Roofs"—address Department 31.

CAREY Insulations Also Used:
Hot water pipe and air-conditioning lines in new Western Electric Building are CAREY Insulated. Insulation by Brumbelow Plumbing and Heating Co.

THE PHILIP CAREY MFG. CO. • Lockland, Cincinnati, Ohio
DEPENDABLE PRODUCTS SINCE 1873
IN CANADA: THE PHILIP CAREY CO., LTD. Office and Factory, LENNOXVILLE, P. Q.

litical" strikes and political contributions illegal—also the closed shop. At the same time, the labor leaders are reported to have learned from long experience that no union can long enjoy security after it is free from the necessity of obtaining its dues through the serving of its members.

Legislators' Error

The error of our legislators here is that they have failed to see that in the field of work the rule of the majority can be safely followed only when, if, and as the rights of minorities are amply protected. Outside our plants, our minority groups and individuals continue to enjoy the Bill of Rights and a multitude of other protections, even though their political rulers are elected and their taxes levied by majorities. It is fairly safe to say that unionism will be secure only when in our factories minorities either gain such legal protections as our federal labor laws, in spite of good intentions, now fail totally to give, or else become convinced that their leaders possess such moral qualities as make such legal protection unnecessary.

Exactly this essential principle of democracy explains why closed shop has seldom lasted long when it has been utilized in religion. Time and again a state church has been legislated in order to put an end to the "jurisdictional" bickerings of opposing or competitive sects—only to have the disregarded minority, sooner or later, openly or covertly, flaunt the state's decrees and follow instead the "higher law" expressed or felt in the moral dictates of its conscience.

What Men Seek

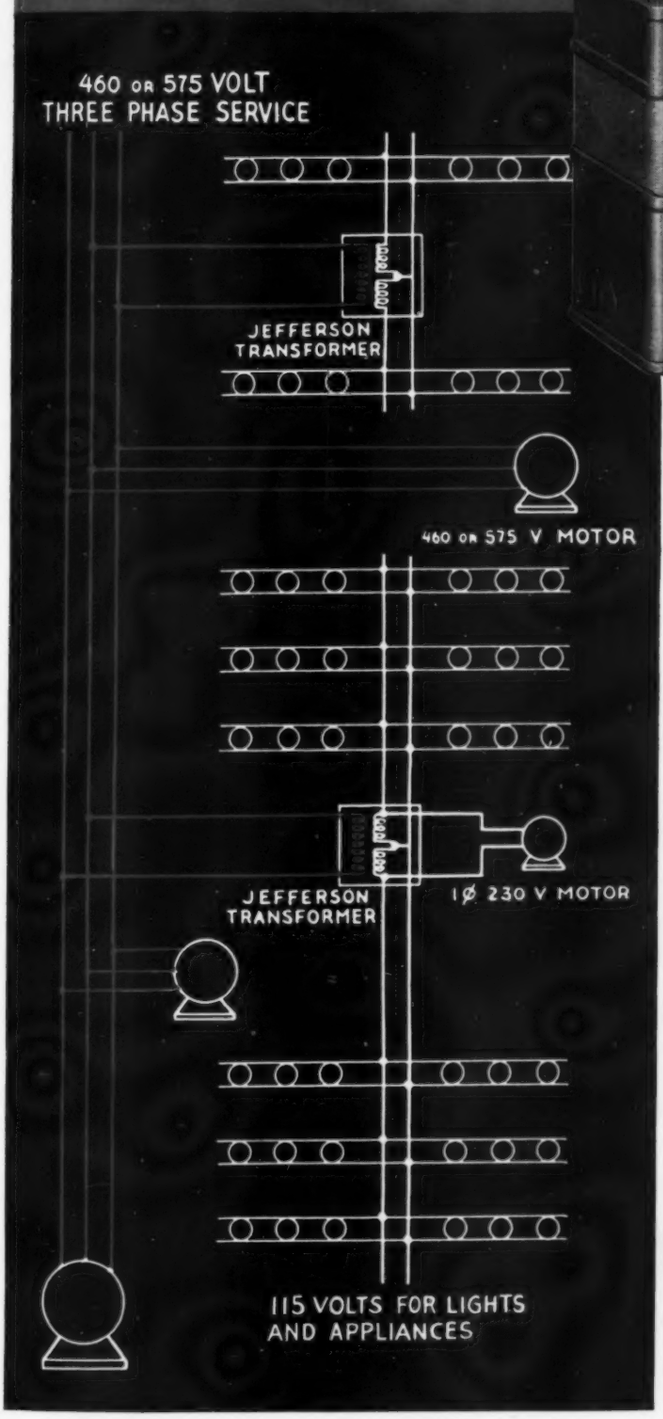
What those who passed the Wagner Act, and those who first administered it, overlooked (because they did not know the mind and heart of workers) is this—that men everywhere seek in their daily task exactly the same kind of self-respect, self-value, and spiritual self-justification that they seek also in their religion. If the makers and administrators of our labor laws had known this, they would have also known that men will always believe themselves in duty bound to resist undue compulsion in their work as fiercely and as unceasingly as in their worship.

Today the effort of a new kind of "vested interests" to secure, under cover of the defense emergency, the entrenchment of a permanent closed shop and check-off is endangering our own and the world's democracy, by paralyzing our industrialists and discouraging and demoralizing both our workers and our soldiers. Everywhere is confusion. Nobody in industry

CUT YOUR POWER COSTS
and Reduce Wiring Installation Time

Being air-cooled, you may install them anywhere—no enclosure or vault required.

You help to conserve important metals, too, since less copper and conduit are required



● Reducing power costs—and speeding up wiring installations can both be accomplished by eliminating duplication of power and lighting systems.

This is done by distributing only the higher-voltage lower power rate current, and providing the lower voltage circuits where desired for lighting and appliances by means of Jefferson Electric Power Circuit Transformers.

Less copper and conduit are required, installation time is reduced, load centers can be located to prevent line drop, and more stable voltage conditions maintained.

Bulletin 401-PCT will be mailed on request . . . JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. Canadian Factory: 60-64 Osler Avenue W., Toronto, Ontario.

JEFFERSON
ELECTRIC
POWER CIRCUIT TRANSFORMERS
AIR-COOLED

THE GOVERNMENT COMES FIRST

Ward Leonard is under National Defense production. The goods we make are not used by themselves but become component parts of other equipment that may not be finished for many months. It is vital, therefore, that we give the government earliest possible deliveries.

There is room in our shop from time to time, however, for non-conflicting requirements which we wish to make available to our old friends. Yes, we want your inquiries . . . we will give them our best attention possible.

WARD LEONARD ELECTRIC COMPANY
55 SOUTH STREET, MOUNT VERNON, N. Y.

WARD LEONARD
relays . . . resistors . . . rheostats

ELECTRIC CONTROL DEVICES SINCE 1892

knows what the government wants. The country's much-praised Railway Labor Act forbids closed shop. Our National Labor Relations Act is believed by many to do the same, but its meaning on this point has never yet been given legal interpretation. Our Army and Navy are legally estopped from even dealing with unions. The attitude of our National Defense Mediation Board towards closed shop is wobbly and uncertain. Several cabinet members and other officers equally powerful appear to view closed shop's inflationary dangers with alarm. Many millions of our wage earners have been legally made into voiceless, unprotected minorities. And every day Hitler's panzers keep moving—while here the battle for the closed shop grows daily hotter.

We still have no national labor policy. We should have none until we have done more careful, more discerning thinking about it than our present emergency permits. Under the circumstances, wouldn't the great majority of us rise up and call Washington blessed if, meanwhile, it suggested that we put this closed shop issue on ice until ——?

Employee Handbook Answers All Questions

(*Continued from page 67*)

couragement, (10) education, (11) general.

The second section of the foreman's book, which is all that the other employees receive, is headed "Facts About You and Your Company." It tells how the company was founded by John B. Stetson, who started in a small way as an individual in 1865. It gives information about the company's products and sales. Then come brief items on: Hiring, rehiring, collective bargaining, grievances, promotions, layoffs, leaves of absence, dismissals, exit interviews, hours of work, timeclocks, payment of wages, absence from work, change of address or name, safety and sanitation, reporting accidents and illness, regulations for protection from fire, security plans, and various facilities for employee convenience.

Ninety percent of all questions involving company policy are answered in the book. During all the time the manual has been in existence, the question of how a man can be dismissed without causing a dispute with the union has never been raised. We consider that the most important

Of *all raw materials . . .*
Facts are the scarcest!

Take away the machinery of management—business systems—and you sweep right off the board our entire Defense Program. We can't go ahead without records—yet, we can go ahead a lot faster by gaining *greater control* over recorded facts—*the scarcest of all raw materials.* Today, as never before, the volume of paper-work and record-routine is reaching flood proportions. Today, as never before, the *facts* engulfed in this ocean of paper must be accessible.

That's why Remington Rand Business Equipment and Kardex Visible Systems of Business Control are serving in every defense industry and in all branches of Government. They bring to the surface hidden facts, prevent delays. They speed production, cut costs. They create control, eliminate guessing.

Remington Rand's famous Safe-Cabinet division now has available fire protected housings for guarding valuable records — maps and specifications and card indexes and correspondence—from the threats of sabotage and accidental fires.

Remington Rand Knows the Answers to your Record Problems

Remington Rand, in cooperation with many leading defense manufacturers, has developed efficient PRODUCTION, PROGRESS, PLANNING, MATERIALS SCHEDULING and PRIORITY RECORDS. This experience and knowledge is recorded in printed, illustrated educational releases. You may now enjoy the benefits of this production-research without cost or obligation simply by phoning our local office, or, writing directly to Remington Rand Inc., Buffalo, New York.

STEEL FILES

SAFE-CABINETS

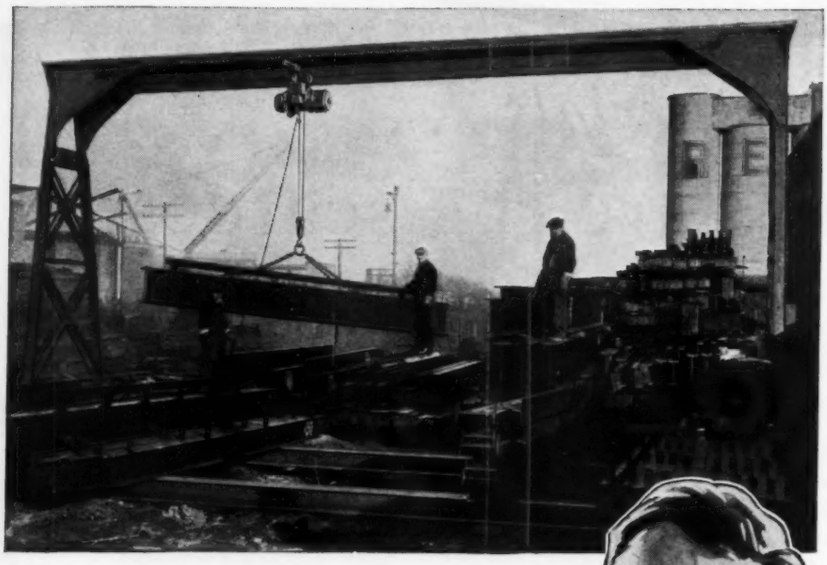
MODERN SAFE-KARDEX

SAFE-FILES

HOLDERS OF $50,000,000 OR MORE IN DEFENSE CONTRACTS

Bethlehem Steel Corporation
N. Y. Shipbuilding Corporation
General Motors Corporation
Curtiss-Wright Corporation
Newport News Shipbuilding & Dry Dock Co.
E. I. Du Pont De Nemours & Co.
Glenn L. Martin Company
Consolidated Aircraft Corporation
United Aircraft Company
Douglas Aircraft Company
United States Steel Corporation
Seattle-Tacoma Shipbuilding Corp.
Boeing Airplane Company
Bath Iron Works
General Electric Company
Ford Motor Company
Electric Boat Company
North American Aviation, Inc.
Cramp Shipbuilding Company
Speery Corporation
Bendix Aviation Corporation
Western Cartridge Corporation
Consolidated Steel Corporation
Baldwin Locomotive Works
Los Angeles Shipbuilding and Dry Dock Corp.
American Car & Foundry Corporation
American Woolen Mills
Chrysler Corporation
Packard Motor Car Company
Tampa Shipbuilding Company
Republic Aviation Company
Grumman Aircraft Corporation
American Locomotive Company
Ingalls Shipbuilding Company

. . . *and* REMINGTON RAND *serves them all.*

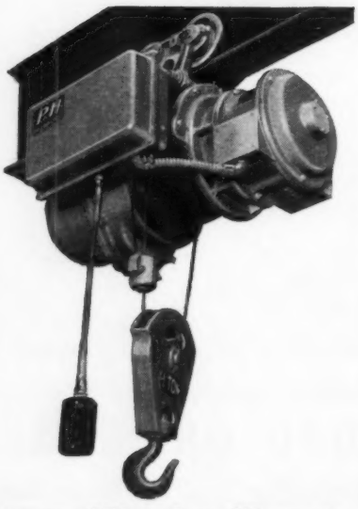


What's *Your* Cost For Handling Loads Like These?

Ever pin down the cost of moving loads in yards, warehouse, or in production? Try it! And compare it with the low cost of doing it with modern P&H methods and equipment.

Or Any Load?

Whether it's steel or cotton—whether you move it 5 or 500 feet—fast overhead handling speeds up production, cuts man and machine hours—and floor maintenance bills. These important savings increase output and reduce final manufacturing cost.



Handle It "Through the Air"

Whatever your particular job, let P&H Hoist Engineers help you with their experience in solving thousands of material handling problems. Ask one to call and show you how fast, "thru-the-air" handling can answer your needs.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

statement in the book is the one that says no employee shall be dismissed without a fair hearing. Firing at Stetson has got to be on the "up and up." No one can be fired without a good and sufficient reason.

This book is the outcome of a sincere attempt to put down in black and white the company's policy on these perplexing questions of hiring, firing, promotion, and so on. Distributing the manual goes far towards eliminating from the minds of the employees fears that grievances will not be handled fairly and that favoritism will be shown. Such a method of putting all the cards on the table is bound to result in healthy labor relations, and promote respect for the company.

Piece Parts Control Speeds Selection for Assembly

(*Continued from page 69*)

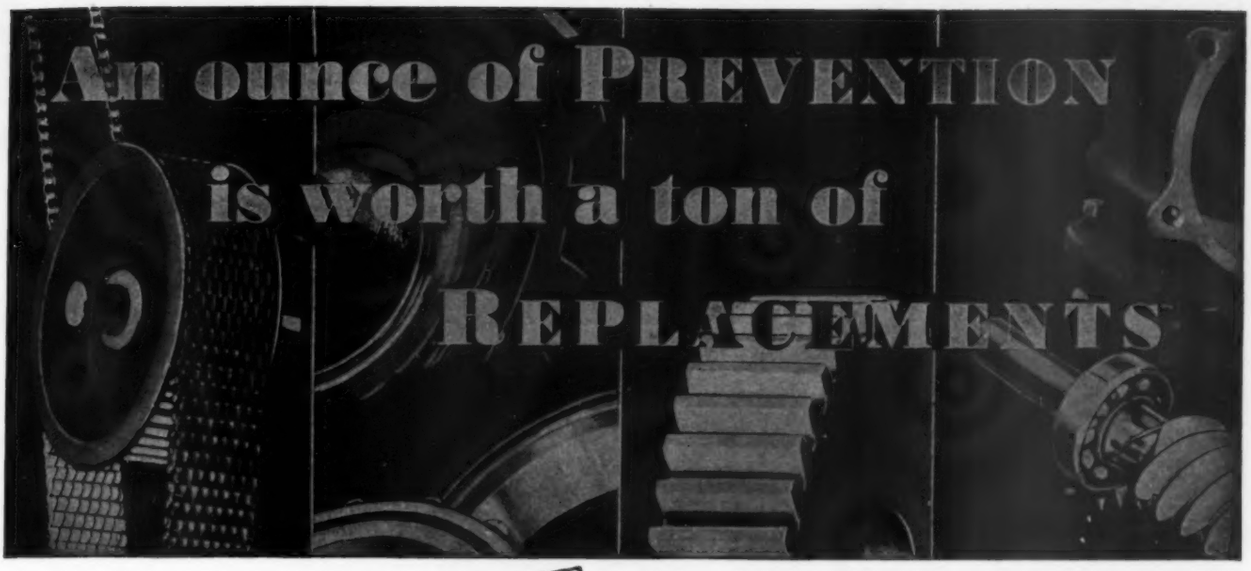
are checked through the stockroom procedure for count, but physically taken to the assembly floor and placed in bins at the end of assembly benches in the same manner as the purchased parts.

In addition to changes in parts locations in the stockroom to correspond to the listing on the bill of material, other changes were made in the mechanics of stockroom operation to speed up selection. A lighting duct is suspended in the aisles between each two rows of the stock racks that lead at right angles from the main aisle. This duct—together with a track for the rollers on the upper end of a ladder that is provided in these rack aisles—is supported from the top of the steel bins. One light on each side of the ladder drops from a bracket, and can be slid back and forth in the light duct. When the selector needs to get parts from a bin on the upper shelf, he can easily and quickly push the ladder and the light to the desired point. He is not hampered by inability to see clearly, as he would be if the lights were on fixed centers.

Safety Latch

To make the record complete, when the ladder has been rolled into proper position for stock selection, a safety latch is let down to stop the two wheels attached to the bottom. This must be done as a safety precaution before the ladder is used.

This plan of stock-selection has been in operation long enough to indicate that it meets the difficulties formerly encountered. Responsibility is centralized, because each stock selector works from a bill of material on which



THE CENTERLESS GRINDING CO., INC.
Hardened and Ground Screw Machine Products - Production and Custom Grinding
Small Shafts, Spindles, Taper Pins, Small Cams Made to Specifications
19 STAPLES STREET
Bridgeport Connecticut

October 1, 1941

Lubriplate Division
Fiske Brothers Refining Co.
129 Lockwood Street
Newark, N. J.

Gentlemen:

We wish you to know how pleased we are with your Lubriplate. We have been trying to obtain a lubricant which will retain its film but have found nothing which has proved satisfactory until we began using your Lubriplate 130-A.

Not only does this Lubriplate retain its film but, on infeed grinding on our Cincinnati Centerless grinders, it has increased production, in some instances as much as ten per cent.

We want others who are seeking this type of lubricant to know the satisfaction which your Lubriplate 130-A will give, and highly recommend it to them.

Very truly yours,
CENTERLESS GRINDING WORKS
Wm. Horburg
President

WH:MT

Defense Production

makes replacement parts such as bearings, gears, chains and other machine parts hard to get. It's your patriotic duty to conserve them.

That is why practically every type of industry is demanding more and more LUBRIPLATE Lubricants. They stop progressive wear . . . they prevent rust and corrosion . . . they conserve power.

This unsolicited letter is typical of those we have received from machine manufacturers and users all over the country. If you are not yet using LUBRIPLATE get in touch with our nearest dealer today.

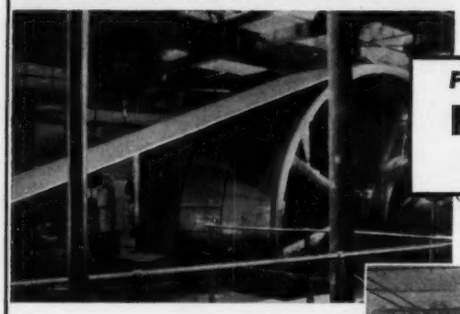
LUBRIPLATE DIVISION, FISKE BROTHERS REFINING CO.
NEWARK, N. J. TOLEDO, OHIO
DEALERS FROM COAST TO COAST.

LUBRIPLATE

THE MODERN LUBRICANT *that Arrests Progressive wear*

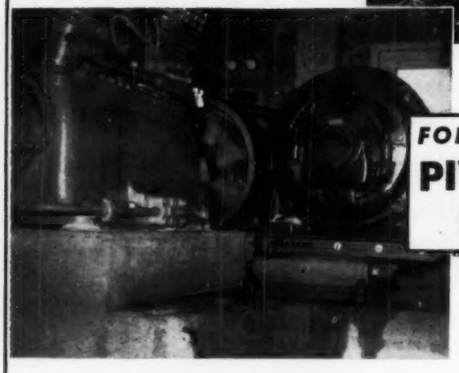
Years and Years of Users' Experience have proven

YOU CAN DEPEND ON TANNATE



FOR PRIMARY DRIVES

FOR MODERN GROUP DRIVES



FOR PIVOTED-MOTOR BASE DRIVES

In normal times and during every period of industrial emergency and growth, QUALITY LEATHER BELTING has positively proven its fitness to INCREASE PRODUCTION. You can rely on it today as you relied on it since the birth of American Industry. Use TANNATE (proven quality) Leather Belting for Primary Drives; Group Drives; or in connection with the well known Rockwood Pivoted-Motor Base (TANNATE-Rockwood Drives). For any purpose, it will lessen shutdowns and save time and money.

J. E. RHOADS & SONS • 35 North Sixth Street, Philadelphia, Pa.

NEW YORK • CHICAGO • ATLANTA • CLEVELAND

STEP UP PRODUCTION WITH

RHOADS

Established 1702

Tannate

WATERSHED LEATHER BELTING

are listed in numerical order all parts that he should select. Therefore missed parts do not delay operations after the order is in assembly. More orders can now be cleared through the stockroom, because running hither and yon for parts is no longer necessary. Although with the increase in sales we have added stock selectors, we have not added as many as would have been necessary had we been operating under the old plan. A large sales increase has been absorbed without a corresponding increase in delayed deliveries, because of the greater speed and accuracy in part selection. Morale of stock selectors is better—when they get an order to put up they can be satisfied that they have accomplished what they set out to do, and they are no longer subject to the old complaints about a poorly done job.

Right Rates the First Time

(*Continued from page 76*)

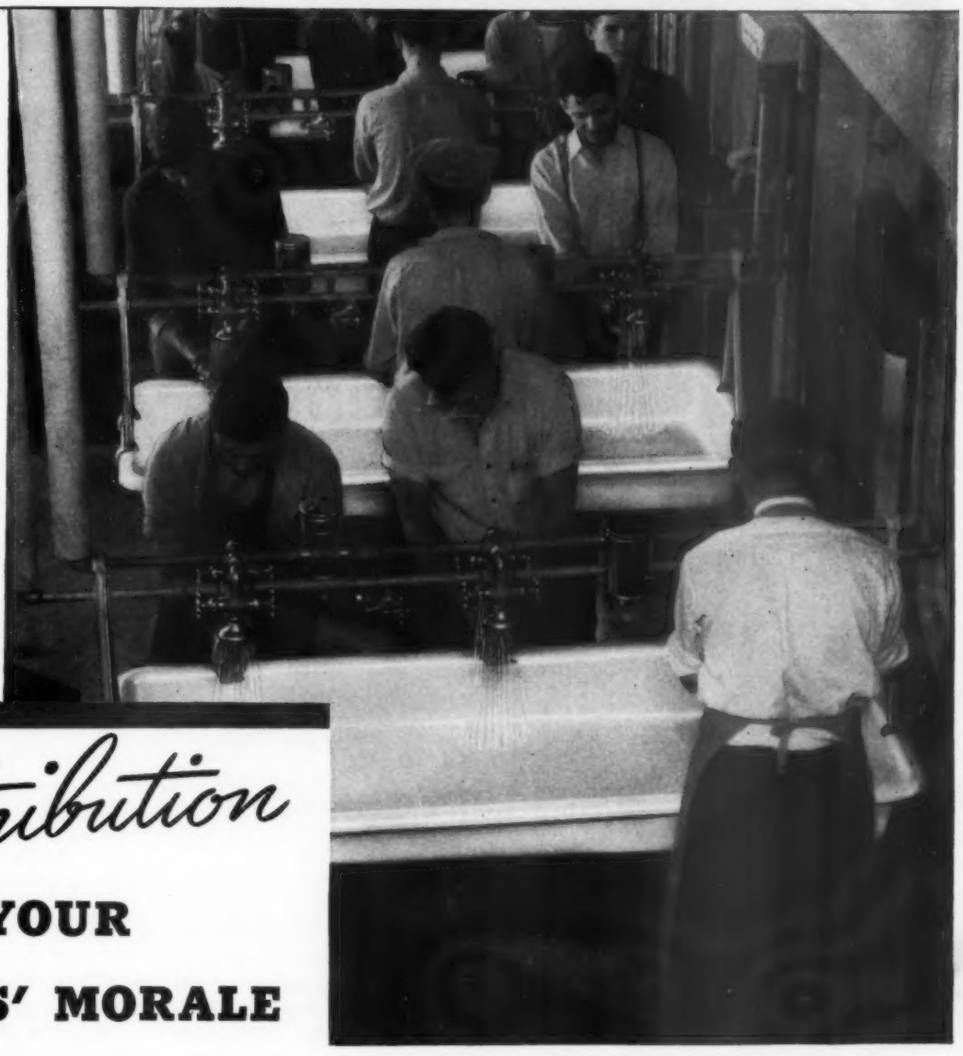
2½ points been added, three cents would have been added to the base rate. Perhaps it should be added that the supervisor must concur in these evaluations.

The relation of the time-study department to supervision—while it should not be dignified into a problem, must be thoughtfully handled. As intimated before, a time study is not made until the foreman is satisfied that the job is running properly. In fact, every change is made through the foreman, because he will then set a job up properly when it is run again. The worker is encouraged to discuss any questions he may have about standards with the foreman.

Rate Average Operator

Our foremen are not taught rating. In at least one instance a foreman objected to an observation of a very efficient and fast operator, where several were doing the same operation. Of course it does not matter whether a fast or a slow operator is observed, so to satisfy the foreman a slower operator was selected. (Another reason for not taking the fast worker was its possible effect on morale—operators would feel that speed-up was in the picture.) This is an example of a typical observer-supervision relationship. I said that it does not matter whether a fast or a slow operator is observed. That is not quite true. Actually we find a much better agreement in the rating sessions where

CRANE INDUSTRIAL PLUMBING • • DESIGNED FOR DURABILITY



A *Contribution*

TO YOUR

WORKERS' MORALE

★ The health—the comfort of your employees is vitally important to your production—it is important to the morale of your workers, too.

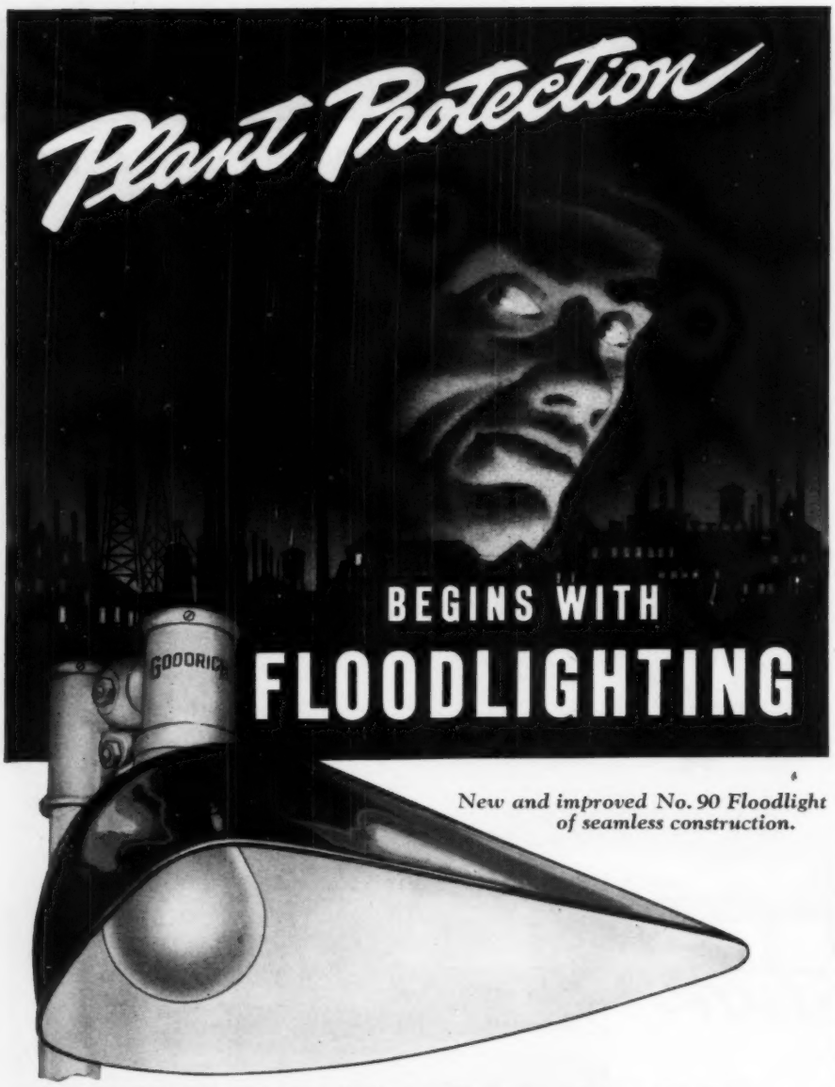
Crane industrial plumbing is designed for maximum convenience—maximum comfort and maximum sanitation. Its installation will help promote employee health and cut down labor turnover. Above all, Crane plumbing equipment will stand hard use—day after day and year after year. If you do not have a copy of the Crane book, "Crane Plumbing for Industrial and Commercial Buildings," write for one. It contains valuable ideas as to how plumbing may aid your production.

CRANE

CRANE CO., GENERAL OFFICES: 836 SOUTH MICHIGAN AVENUE, CHICAGO

VALVES • FITTINGS • PIPE • PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING CONTRACTORS



New and improved No. 90 Floodlight of seamless construction.

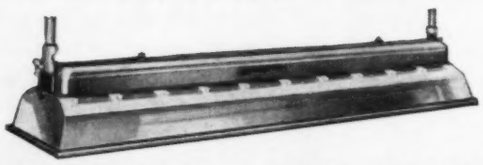
AROUND defense plants, floodlighting is an effective barrier which safeguards property and life against saboteurs.

Ideal for this purpose, the new Goodrich No. 90 Floodlight, of seamless construction, provides still greater efficiency in illuminating large areas uniformly. It's finished in permanent porcelain enamel, weather-proof, rugged; equipped with rust-proof ventilated hood for pole or bracket mounting. Ask for catalog sheets.

GOODRICH
INDUSTRIAL LIGHTING

GOODRICH COMPLIANCE WITH RLM STANDARDS

HILLCREST FLUORESCENT FIXTURE —an exclusive Goodrich design with top apertures which create "daylight" conditions.



SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4604 BELLE PLAINE AVENUE, CHICAGO, ILL.

extremes are not involved, because we see less of the extremes than we do of limited variations on each side of normal speed.

In an earlier stage of our time-study work, the foreman would call for a study and a rate. The observer would go down to the job, take a few observations, and set a temporary rate that could be adjusted either way when the film analysis was available. This was not satisfactory. In fact, it encouraged carelessness on the part of the observer, because he knew that any slips would be caught later. Now the rate is guaranteed as soon as it is set by the watch study, and the observer must be right the first time. To this change in policy is due our insistence that the supervisor approve the method before the study is taken. The observer also must be convinced that the method is a reasonably good one. Under this plan our output of rates per observer has been reduced one-third in the last two or three years.

On a job change the new rate is set the same day that the time study is made in order not to leave the operator up in the air. However, where experience is needed on a new job, it is usual to allow seven days' operation before the study is made. This enables the operator to accumulate experience, and supervision to make whatever adjustments may be necessary.

Method Changes

We have difficulties with method changes. It seems to be natural for supervisors not to notify time study when changes occur. There is justification for this, as an accumulation of several small changes, each of which is unimportant, may go unnoticed. To get around this situation the operation description card (Figure 4) was inaugurated two years ago. One copy is placed at the job, and another is filed with the time-study data. We now find that, if additional work is required, the worker is quick to call it to the attention of the supervisor and to the time-study observer, if action is not secured fairly quickly. It must be admitted that this action does not work in the reverse direction, but for worker satisfaction it is not as important as the way in which it does work.

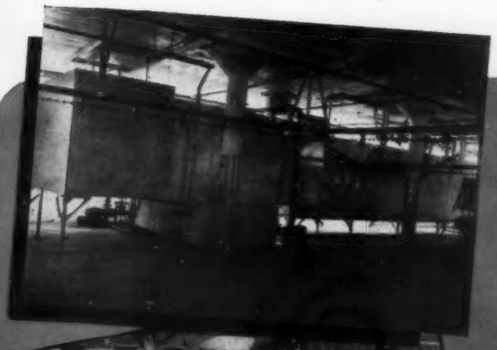
Small runs are another problem that confronts the time-study department. We study and set the rate the same way on a job where the output is 50 pieces per month as we do where the output is 50,000. On the small, seldom repeated jobs, the operators do not have a chance to develop skill and get into the swing of things. On governor-assembly, for example, some

Here's How

MAHON

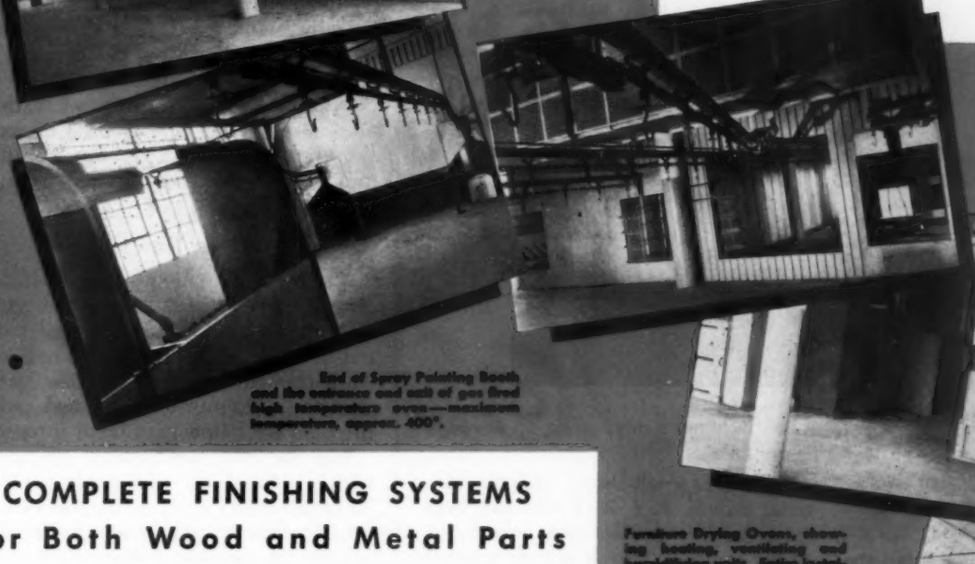
FINISHING EQUIPMENT

meets today's production overload

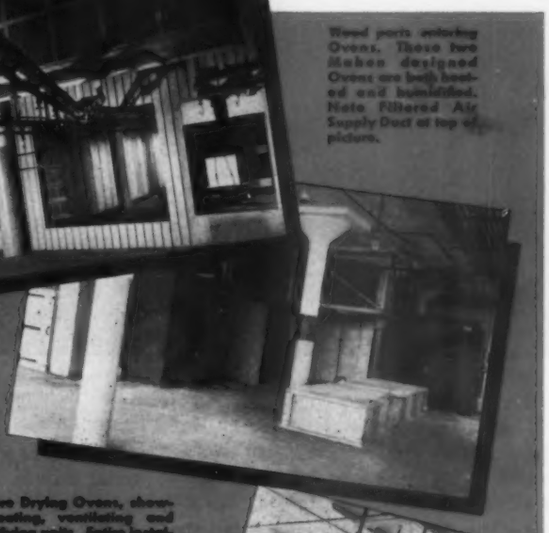


Two-stage steam heated Washing Machine and gas fired Dry-Off Oven for metal parts.

Conveyors entering Spray Room enclosure.



End of Spray Painting Booth and the entrance and exit of gas fired high temperature oven—maximum temperature, approx. 400°.



Wood parts entering Ovens. These two Mahon designed Ovens are both heated and humidified. Note Filtered Air Supply Duct at top of picture.

Furniture Drying Ovens, showing heating, ventilating and humidifying units. Entire installation is accomplished in the minimum of space.

Mahon Furniture Heating, Ventilating and Humidifying Unit. These Units are shipped complete with motors, fans, heaters, automatic temperature and humidification control and filtered air supply.

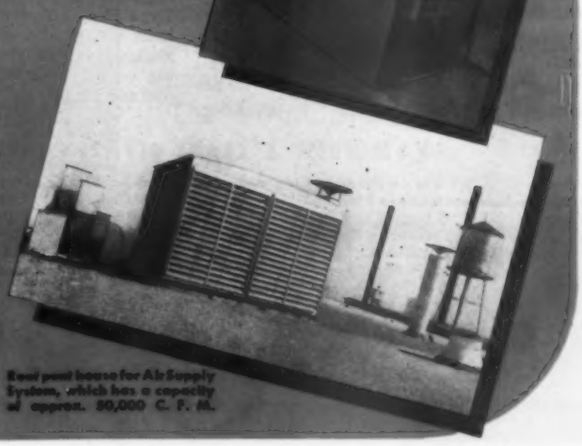
COMPLETE FINISHING SYSTEMS
For Both Wood and Metal Parts

Outmoded and inadequate Finishing Equipment cannot cope with today's tremendous production overload without serious delays occuring—and consequent inroads into profits. You will be interested in how the Lloyd Company, of Menominee, Michigan—with the cooperation of Mahon engineers—put its Finishing departments, both metal and wood, on a highly efficient and productive basis, as illustrated herewith. Look this installation over carefully. It may suggest to you how *your own* Finishing department may be modernized and co-ordinated to avoid slowdowns and delays in *your* production line. Our engineers will gladly survey your plant and advise you to what extent your production can be speeded up. Consultation costs you nothing. Write today.

THE R. C. MAHON COMPANY

DETROIT — — CHICAGO

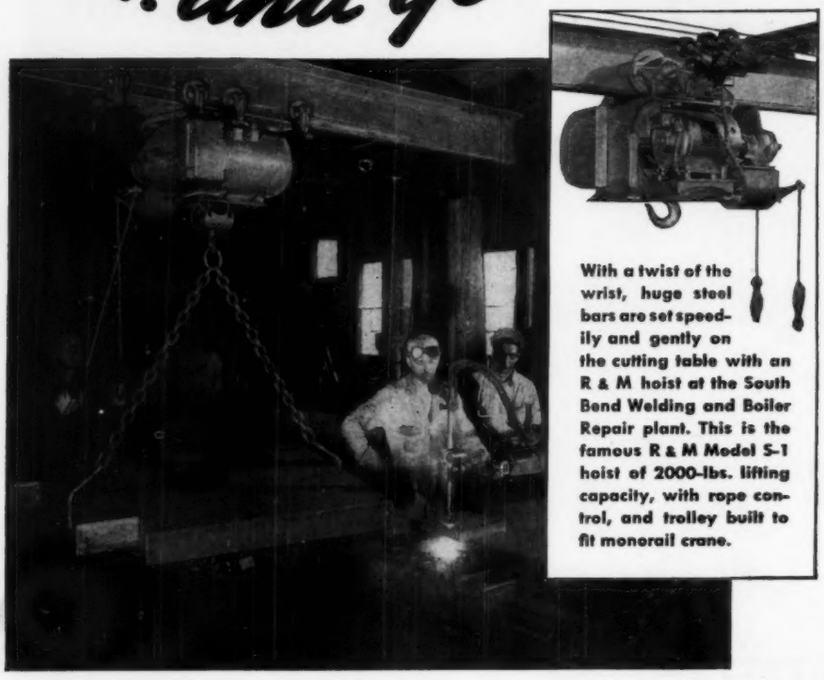
Designers and Manufacturers of Complete Finishing Systems, Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Systems, Hydro-Foam Dust Collectors and many other Units of Special Production Equipment.



Roof paint house for Air Supply System, which has a capacity of approx. 80,000 C. F. M.

MAHON

THEY BEGGED FOR MACHINE PARTS ... and got 'em!



With a twist of the wrist, huge steel bars are set speedily and gently on the cutting table with an R & M hoist at the South Bend Welding and Boiler Repair plant. This is the famous R & M Model S-1 hoist of 2000-lbs. lifting capacity, with rope control, and trolley built to fit monorail crane.

"Give us machine bases, jigs and fixtures . . . faster," pleaded manufacturers. But the South Bend Welding and Boiler Repair plant, straining day and night, was "bogged down."

An R & M engineer soon spotted the trouble. Material and finished products were moving too slowly . . . taking the time of two men tussling with an old-type chain hoist.

He recommended installing an S-1 Type R & M 2000-lb. hoist with monorail trolley. It worked a miracle.

Now South Bend Welding and Boiler Repair is meeting orders on schedule. Handling time of steel and finished products has been stepped up 70 per cent. One man moves tons with a twist of the wrist. The hoist paid for itself within a few months . . . is working 12 to 14 hours a day, piling up *savings* every hour.

In large or small plants, wherever material moves, R & M hoists can help speed *your* manufacturing schedule—*at big savings*. Two thousand standard hoist and crane models provide as many answers as there are problems. Contact your nearest R & M hoist and crane division office and "take it up" with R & M—today.

Save headroom, time and money with R & M's new "ceiling hugger"—the R & M Type F-½ *all-steel* hoist. Write today for Bulletin No. 800, giving complete details and specifications.

R & M HOIST & CRANE DIVISION OFFICES:

Atlanta.....319 Walton Bldg.
Baltimore, Lombard & Concord St.
Boston.....55 Long Wharf
Buffalo.....2005 Delaware Ave.
Chicago....2400 W. Madison St.
Cincinnati.....418 New St.
Cleveland..352 Rockefeller Bldg.
Dallas.....1100 Cadiz St.
Denver.....1420 16th St.
Detroit.....2921 E. Grand Blvd.
Houston..3715 Harrisburg Blvd.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia...401 N. Broad St.
Pittsburgh....H. W. Oliver Bldg.
Providence....44-46 Clifford St.
San Francisco..237 Rialto Bldg.
Seattle.....216-17 Walker Bldg.
Syracuse..204 State Tower Bldg.
Montreal....Lyman Tube & Supply Co., Ltd.

ROBBINS & MYERS • Inc.

HOIST & CRANE DIVISION • SPRINGFIELD, OHIO

MOTORS • FANS • MOYNO PUMPS • FOUNDED 1878

20 to 30 jobs may be worked on by an operator in one day. In such cases a flat job rate would not be equitable. A constant job-change allowance was not entirely satisfactory. There was no flexibility as the number of jobs varied.

A solution to this problem, and a satisfactory one although empirical in nature, was to plot efficiences as compared to job standard times against number of jobs worked upon in one day—as the number of jobs increased, the percent of efficiency (or the standard hour) decreased. A curve was drawn in which the standard minutes per job were plotted against percentage increase in standard minutes to be allowed, with an upper limit of 35 percent—the empirical part of the plan. This curve is used by the payroll department in making an adjustment in the standard time, or task, in calculating the operator's earnings. Time study determined, by construction of the curve, what the allowance should be. By this device, the time-study methods can be the same regardless of the number of parts run at one time.

Training New Men

The new man—the time-study observer-to-be—is a frequent occurrence in these days of increased output and of changes to new kinds of work brought about by defense production. He must be trained, and the plan we follow may be of interest.

For the first two months the new man is placed on film analysis. As he makes a film analysis, he goes down into the shop and studies the job to get the relationship between the two, and to get a proper concept of what he is doing. During this period he attends the rating sessions and joins in rating the films in competition with experienced observers. His ability to discern variations in speed and effectiveness is thus constantly checked, and we have a measure of his progress on the speed-rating summary (Figure 8). These sessions take place four times a week when the department is busy. In these sessions, and in comparing the film analysis with the job as it is run in the shop, he finds that the tendency is to rate the film about five points higher than when rating the same job on the floor, and gradually he learns to make the proper adjustment.

Detailed supervision is thought not to be proper, for the new man must be taught to take responsibility the moment he is ready for it—responsibility for a proper job of rate setting and for correctly answering questions put to him by supervision and by workers. About once a month, for

YOU DON'T *HAVE* TO USE FILING CABINETS

and you CAN *"get by" cleaning your plant with brushes and brooms*

Of course you won't waste valuable time searching for important papers stored in a hit-or-miss fashion. And when you have all the facts you will realize that it is also highly inefficient to clean your plant with brushes and brooms instead of industrial vacuum cleaners.

To begin with, hand cleaning costs at least 5 times as much as vacuum. In one typical case the cleaning cost per pound of dirt removed was 30¢ with brushes and brooms and 4¢ after Invincible Vacuum Cleaners were used.

In the second place, Invincible Vacuum Cleaners insure a perfectly clean plant, something that is almost impossible to obtain with hand cleaning. Brushes and brooms merely push the dirt into piles, creating fly dust that soon resettles.

Furthermore, Invincibles reach *every* part of the plant. These light, easily-handled units are equally efficient on walls, ceilings, beams, bins, pipes and machinery, as well as all types of floors. For perfect cleaning there is *no* substitute for vacuum.

Invincible Vacuum Cleaners can profitably put all these advantages to work in *almost every type of plant.* We know this to be true, because in the last 35 years we have supplied thousands of Invincibles to all major branches of industry.

If you want to have a cleaner plant, and save money at the same time, let an Invincible engineer study your problem. There is no obligation in learning about this modern cleaning method. Write The Invincible Vacuum Cleaner Mfg. Co., 440 Davis St., Dover, O.

INVINCIBLE INDUSTRIAL VACUUM CLEANERS

MORE THAN 15,000 IN USE FOR OVER TEN YEARS

Here is a MUST Reprint

★ for any plant engaged in defense work—
or expecting to be so engaged

How to Get More Production

IS THE TITLE

★

The contents include

50 CASE STUDIES IN

Subcontracting
Plant Conversion
Multiple-Shift Operation
Twenty-Four-Hour Maintenance
Planning and Scheduling
Work Simplification
Training Operators and Foremen
Rating Jobs and Men
Safeguarding Health
Insuring Plant Protection
Employee Identification

Get a copy for yourself, yes. But get, also, copies for all your key men. Good ideas are valuable wherever you find them. And these case stories are inspiring

★

1 to 9, $1 each; 10 to 24, 90¢ each; 25 to 49, 80¢ each; 50 to 99, 70¢ each; 100 to 249, 60¢ each; 250 or more, 50¢ each. All f.o.b. Albany, N. Y., except single copies, which are postpaid.

MAIL THIS COUPON

Editor, Factory,
330 W. 42nd St., New York, N. Y.

Send me ——— copies of "How to Get More Production" @ ——— each, plus shipping charges (single copies are postpaid).

Name .....

Address .....

City and State .....

the first six months, his problems are discussed with him, and individual study is suggested. Early in these sessions the importance of correct method is stressed, and such things as unnecessary transfers, cross-handed operations, and bad stock placement are pointed out as things to be avoided.

At the end of six months, or at the end of from three to four months, if his progress is sufficiently rapid, the new man will be given the chance to set rates on simple jobs where method and speed are clear, or where a change has been made on a job already studied. If an air blow-out is installed, for example, he will be given the task of studying the job to determine if stock is irregular, how many pieces have to be pried out of the die, and what adjustment should be made in the established standard. In these first studies he works with an experienced observer at his elbow, who checks the study and turns it in to the head of the department for consideration at the monthly problem conference.

It is important to encourage the new man to set rates early in his career, but they must be carefully checked for accuracy. After this course of procedure for some six months, the new man is started in the press department, where method is generally standardized and speed is easier to evaluate. He is still under the wing of the experienced man, however. If and when progress is satisfactory here, he is moved to an assembly department where the difficulties tend to multiply.

Although the new man may be setting rates after six months, he is really in training for four years before he is considered an experienced observer in full standing. Throughout this period responsibility for his own acts and for fairness to the worker are stressed. In inculcating the idea of fairness, errors made in favor of the workers are not criticized as severely as are errors he may make the other way.

It has not been the purpose of this article to discuss elementary and theoretical aspects of time study, but to outline some of the problems arising in our practices and to indicate how they are handled. The main effort is spent in setting rates that may be guaranteed at once and which are equitable one with another. Perhaps fatigue allowance (effort rating, Figure 9) might have been mentioned. Certainly it is a problem. Our practice here, however, seems to be in accord with general practice—to select key jobs and fix an allowance for them. Other jobs are then related to these key jobs as far as fatigue characteristics are concerned.

LIKE A Single Piece of Pipe!

Grinnell Welding Fittings identically match seamless pipe... give strong integral joints

Every Grinnell Welding Fitting is *precision engineered* to become an integral part of a piping system . . . a smooth, continuous joint that's identical in strength and service characteristics with the pipe employed!

Here are four major reasons why these fittings speed-up erection of strong, continuous piping systems: (1) Grinnell Welding Fittings weld easier, because they are *metal-matched* with the pipe itself; (2) their ends match-up in weight to standard-weight, extra-strong or O.D. pipe or tubing; (3) their welding faces are correctly scarfed; (4) only plain circumferential butt welds are required to join them.

Specify these *better-engineered* fittings to save time and trouble in erection and operation of your piping systems. Write for catalog, "Grinnell Welding Fittings". Grinnell Co., Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of U. S. and Canada.

ELDING FITTINGS BY **GRINNELL**

WHENEVER **PIPING** IS INVOLVED

ONE HAND CONTROL
One hand controls the CM Comet—the other is FREE to guide the load into position.

SPEEDY
Fast, positive lifting and lowering of the load. Requires but a minute or two to hook up.

ECONOMICAL
Low initial cost... low operating cost. Just a few cents a day operates the Comet.

PLUG IN ANYWHERE
No special outlets or wiring needed... just plug into the nearest outlet—then hoist.

VERSATILE
It's portable... easily removed and installed as it goes from job to job.

In thousands of progressive plants, speedy Comet Portable Electric Hoists are now used to keep machines at peak production. Costly interruptions—waiting for materials—have been eliminated. Production output is accelerated by using Comet Hoists on trolleys, monorails and cranes to lift and transport loads overhead. Wherever careful checks are made, Comet Hoists can always point to an important lessening of worker fatigue. With a minimum investment, a few cents a day for operation, and the simplest operating routine—just plug in the Comet Electric Hoist and it goes to work—you can *step up* efficiency, save valuable floor space and *cut down those "hidden" costs.*

CHISHOLM-MOORE *Hoist* CORPORATION

(Division of Columbus-McKinnon Chain Corporation)

130 FREMONT AVE. TONAWANDA, N. Y.

Branch Offices: NEW YORK • CHICAGO • CLEVELAND

Carter Products, Incorporated

(Continued from page 77)

like a new idea in this shop is treated like a bomb. Everyone's afraid of it. They hinder rather than help it get a foothold. Why are they all so darned scared?"

Al shrugged his shoulders. He didn't know and didn't care.

I went out into the shop. In the welding department I came across Hank Kaley, a set-up man, who was studying some sketches at the desk.

"What's that?" I asked.

"That," asserted Hank, smiling wryly, "is the reason I study the Sunday papers looking for a new job."

"How come?"

"Well, look," explained Hank, "this here's some drawings I made at home, evenings, when I could get the kids in bed and my wife wasn't too burned up about me devoting my evenings to Carter's instead of to her. If uniform dimensional set-up outfits were worked out for different jobs something like this, the toolroom could make them up cheaper, and they could be used year after year."

Pretty Good Drawing

I looked at the drawings. Seemed pretty good to me. "What would you do about the Bates job?"

"That would require a special jig. But a lot of the stuff we run is about the same general pattern. At the present time, we build a special jig for each job, and, when it is run out, we can scarcely ever use the fixture for any other job."

"Hmm. Are you sure it would work?" I asked.

"Of course. Think I spent all this time without knowing?"

"Then, why can't you get it across?"

"Too radical," Hank replied, disgustedly. "Give 'em time to digest it, and it will appear in the shop in some form or other. They'll never admit that they adopted an idea that was mine originally, but that's what it will amount to."

"They'll adopt your baby after it has grown up in their minds, is that it?"

"Yes," stated Hank, "in the meantime it will grow without its mother, and, later on I'll be expected to correct a spoiled child." He laughed at his own analogy, tossed the drawings into a drawer, and went on about his work.

From there, I went to the automatics. Another set-up man, Bob

Speed Up

with a

DE LAVAL CLARIFIER and CLEANER GRINDING COOLANT

★ Keeping grinding coolant clean by means of the De Laval "Hermetic" Coolant Clarifier speeds up production by permitting grinding to closer limits and maintaining fast cutting action of wheels over longer periods.

Cleaner coolant also improves the quality of the product by enabling the production of work having a uniformly better finish and by minimizing likelihood of distortion of work and starting of fatigue cracks.

Finally, the De Laval Coolant Clarifier reduces costs by prolonging wheel life; minimizing wheel dressing; greatly increasing useful life of coolant, and minimizing cleaning of tanks and piping.

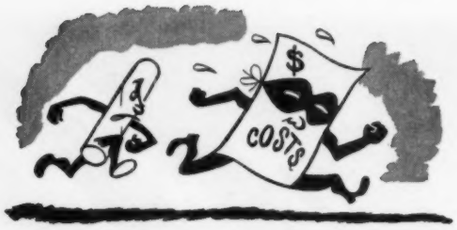
Write today for full information.

★ ★ ★

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 427 Randolph St., Chicago
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco
THE DE LAVAL COMPANY, Limited
Montreal Peterborough Winnipeg Vancouver

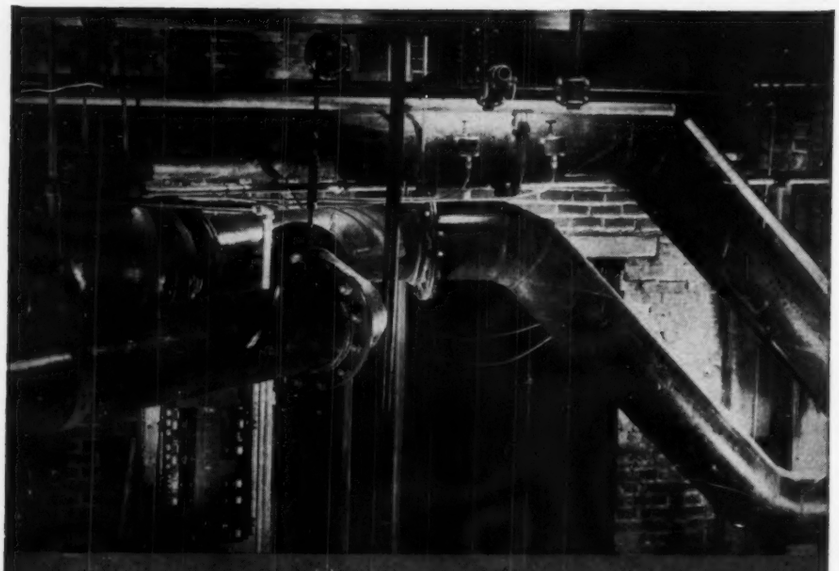
CLARIFICATION of grinding coolant is but one of many ways in which De Laval centrifugal machines are helping industry speed up. Wherever the efficiency of a liquid depends upon its purity—as, for example, lubricating oil—or wherever the value of a dirt-laden liquid warrants its purification and recovery, there is profitable work for De Laval machines—and a De Laval machine exactly suited to the work.

DE LAVAL
"Hermetic"
COOLANT CLARIFIER



crack down

ON PIPING COSTS!



ARMCO'S method of prefabricating pipe simplified the job and saved at least seven sets of flanges on this short section of line. Only a few supports were needed.

You can make pipe dollars go farther and insure trouble-free service by using ARMCO "Spiral Welded" for new lines or replacements.

Savings often run as high as 25 to 30% because every foot of ARMCO Spiral Welded Pipe is tailor-made to fit the job. Standard or special fittings come welded to straight pipe runs and you eliminate at least one pair of flanges at every bend. Even the most complicated layouts go in quickly.

Maintenance is sure to be low when you use ARMCO Spiral Welded Pipe. Fewer flanges naturally mean fewer joints, less chance for leaks. Then too ARMCO Pipe has no threads to weaken the metal and invite corrosion.

ARMCO Spiral Welded Pipe is available in diameters from 6 to 36 inches with wall thicknesses from 7/64 to ½-inch. Mail us your rough plans for a convincing demonstration of its many advantages. We'll submit an accurate cost estimate and a sketch of our proposed design. The American Rolling Mill Company, Pipe Sales Division, 701 Curtis Street, Middletown, Ohio.

ARMCO

SPIRAL WELDED PIPE

Sanner, was working on a new parts-washing machine.

"How's she work, Bob?" I greeted him.

"Okay, kid" he piped, "okay."

"Pretty good outfit, eh, Bob?"

"Yeah, swell. Saves one man's time over the old method. Cost us $1,500. Good investment."

"Okay, Bob," I chuckled. "I get it. Now what's burning you up? What's wrong with it?"

"Come here; I'll show you." He led me over to the desk.

Poking around in his drawer, he finally extracted a copy of a memo he said he had submitted to the engineering department a year ago.

"Read it," he commanded.

I read it. It suggested a type of washer to be attached to the automatic machines, individually, so that parts would come from the automatics already washed, and drop immediately into tote-pans without any handling.

"Hmm," I murmured. "What happened when you suggested this?"

"It Wouldn't Work"

"Your boss, Al Peasely, was fairly well sold on it. He took it to Jim Tyler in engineering and the two came down to see me. I could tell before they started talking that I was licked. Jim says, 'How would this work, Bob, anyway?' I tried to show him my idea of how it could be worked out. He brought up one objection after another; this wouldn't work; that wouldn't work; in fact, to hear him talk, nothing would work. Every time Jim raised an objection, Al sided with him, so what could I do?"

"Do you still think it was a good idea?"

"I dunno, kid. Maybe some of the details, as I saw them, weren't practical. I don't claim to be a mechanical genius or a good designer. But they didn't even try to work it out. It just wouldn't work, that was all—as far as they were concerned. I'm no salesman, and when I try to explain an idea I get all mixed up. I got good and mad that day and told Tyler off. I shouldn't have, and I cussed myself afterwards for losing my temper. But what are you going to do when you're dealing with blockheads who are too lazy to try to work things out?"

"When this new outfit was being planned, did they consult you for your ideas on it?" I asked.

"They did not! Ever since that blow-up a year ago, Tyler thinks I'm the scum of the earth and won't even talk to me if he can help it. They just went ahead and figured this thing out and put it in.

"Look at it! You have to load it at

BWH

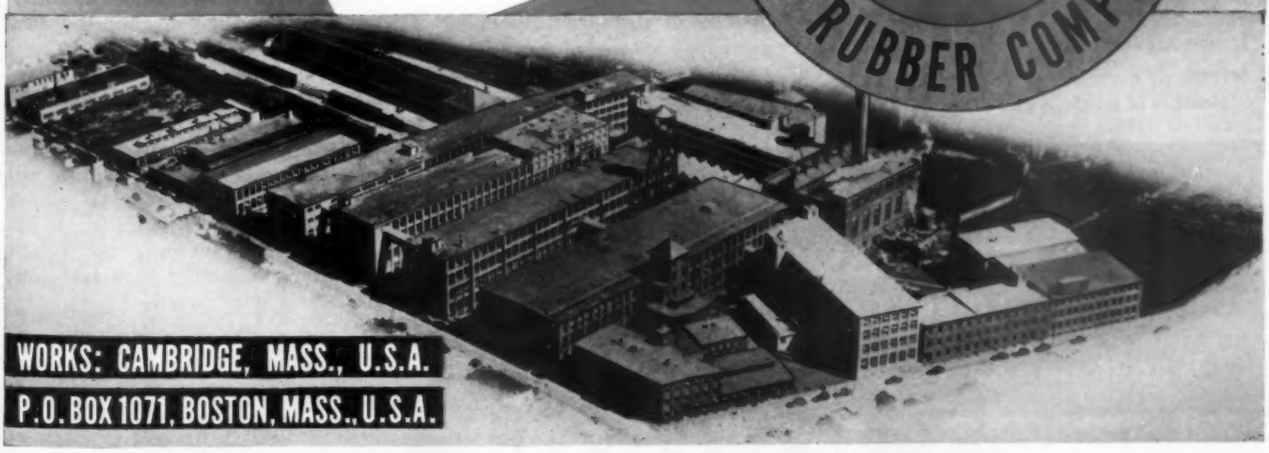
Built With Honor

. . . the symbol of a line of mechanical rubber goods, and of the firm that makes them. You have been accustomed to rely on both the goods and the firm to do their part in industry; you can as confidently rely on them to do their part in the service of the nation, now that this is necessary.

That service must be given in part with men, materials, and machinery which would ordinarily be at your command. You can still command, however, our willingness and effort to serve you to the best of our ability, now and in the future, as fully as we can. And you can be assured that our service, whether to you or to the nation, will be Built With Honor.

BOSTON WOVEN HOSE AND RUBBER COMPANY

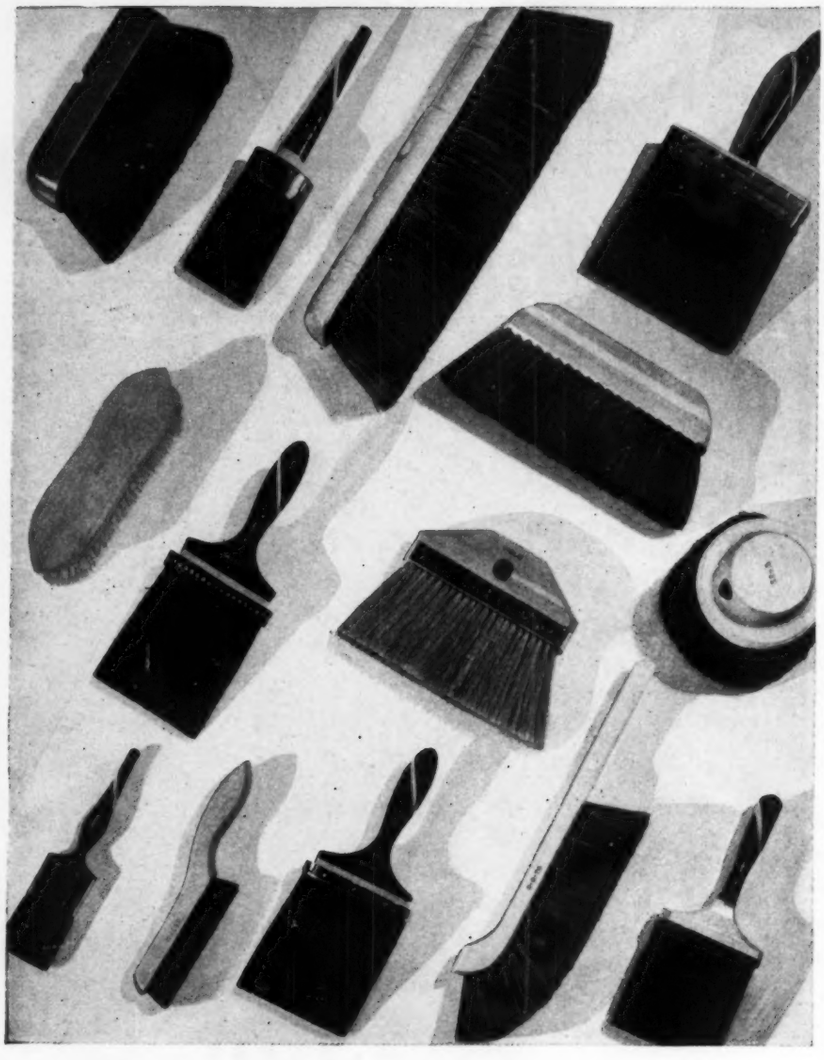
BWH



WORKS: CAMBRIDGE, MASS., U.S.A.

P.O. BOX 1071, BOSTON, MASS., U.S.A.

All kinds of BRUSHES



A Brush for Every Need!

● When you need brushes—phone the Pittsburgh Plate Glass Company. "Pittsburgh" maintains complete stocks of top quality brushes in 81 centrally located service ware houses.

Brushes of bristle, wire and tampico for every industrial need. Floor Sweeps, Mill Dusters, Wire Scratch and Casting Brushes! Also a full line of Gold Stripe Brushes for every paint application requirement.

Send for catalog and for information regarding our convenient, contract service.

PITTSBURGH
PLATE GLASS COMPANY
BRUSH DIVISION · BALTIMORE, MD.

Warehouses In 81 Important Market Areas

one end, and then, after parts are washed, you unload it again. Just ordinary common sense would dictate putting the stock into wash baskets direct from the machine, having the baskets go through it without any other handling, and unloading themselves. Isn't that right?"

"Yeah," I agreed, "looks that way."

"To hell with 'em! I'm making no suggestions to make it work better, either. Let 'em figure things out for themselves. They don't want my ideas."

When I returned to the office, I was pretty low. Why should I spend my time in an outfit that does things the way we do them? Everybody working at cross-purposes.

After a while, I tackled Al Peasely on the subject again.

"Listen, Al, what kind of a place are we running here, anyway?"

He looked up, rather surprised. "What do you mean?"

Why Waste Ideas?

"Why is it that we have loads of ideas out in the shop all going to waste? Why is it that men on the job, who ought to know their stuff, aren't listened to?"

Al's attitude when he answered indicated that he'd rather I didn't bring this subject up. "Probably," he retorted, "because they only think they know what they're talking about, and go off half-cocked on wild ideas about improvements."

"Yes," I agreed, "maybe they do go off half-cocked once in a while, but that's no reason for not listening to 'em. How can the high-hats up here in the office expect the fellows out there to get in and pitch on the stuff they give 'em to work out, when they won't go halfway towards finding out their ideas about methods?"

"What are you getting at, anyway?" questioned Al, guardedly.

"Well," I said, "take that washing outfit down in the automatics . . ."

"Oh, that; what about it?"

"Why wasn't Bob Sanner consulted when they decided to improve the method of washing?"

"Because," asserted Al, "Bob won't work with anybody. Last year, he wrote a crazy recommendation on a new outfit. And he doesn't know anything about diplomacy. He made up a fancy suggestion in writing, to be sure he would get credit for it. If he had understood anything about human nature, he would have told Jim Tyler about it personally."

"Yeah," I said scornfully, "and because it wasn't Jim's idea, and because it wasn't fully developed, it wasn't any good. If Bob had merely mentioned it to Jim Tyler, Jim would have

From Assembly Line To Shipping Room BOSTITCHING Puts Them on TOP OF THE JOB

The Fastening Method—Key to Quicker, Profitable Assembly

In its effort to speed assembly without raising costs to unprofitable levels, industry is giving constant attention to the *fastening method* which will give the best results. In this connection, quite substantial savings have been reported through the use of the right stapling, tacking or wire stitching machine.

In the wood-working, automotive and metal-working industries, particularly good results have been obtained through "Bostitching"—named after the largest manufacturer of staplers and stitchers. Operator production raised 43% by stapling, instead of nailing or gluing . . . costs reduced 2/3 by stapling instead of sewing . . . are two out of many examples.

5 MACHINES PAY FOR THEMSELVES IN 50 DAYS

Nimble mechanical fingers of Bostitch staplers fasten burlap and padding to sea cushion springs, formerly assembled by hand. Total cost of 5 machines absorbed in less than 50 days.

Thousands of dollars have been saved when production executives discovered that motor-driven Bostitch machines can drive wire through steel 60 one-thousandths of an inch thick—at a machine speed of 295 per minute!

Common-Sense Advantages of BOSTITCHING

As well as considerable savings of time and money, the experiences of users prove that it is easy to select the right Bostitch machine, out of the nearly 800 models available . . . and, if desired, progress economically from smallest to largest through liberal rental, trade-in, or budget policies.

In addition, 18 Research Engineers, and over 300 representatives in more than 100 U. S., Canadian, and other cities specialize in fastening problems and are ready to adapt Bostitching to your needs. For further information, or case studies, write Bostitch, 60 Division Street, East Greenwich, R. I.

(*Advertisement*)

45% OF ASSEMBLY COSTS SAVED

"We saved 45% on fastening of upholstering and side covering on studio couches. The job was formerly done with hammer and tacks — now with Bostitch Stapling Hammers."

50% OF PACKING COSTS SAVED

"In packing our mattresses and studio couches, we saved 50% by using Bostitch staples instead of tape and twine."

Further facts and case studies will enable you to check *your* fastening efficiency — on the assembly line — in the shipping room — by finding out how much time and money Bostitching* can save for you. Write today! Send samples to be fastened, or describe your particular fastening or packing problem.

*BOSTITCHING — using the right stapling, stitching or tacking machine, and the exact size and kind of staple to get the most efficient fastening results.

SEND FOR FREE FOLDER

BOSTITCH

fastens it better with wire

STAPLING · STITCHING · TACKING

BOSTITCH, 60 Division St., East Greenwich, R. I.
(or Bostitch-Canada, Ltd., Montreal)

Send me free folder

- ☐ "Bostitch Fastens It Better with Wire"
- ☐ "Bostitch in the Shipping Room"

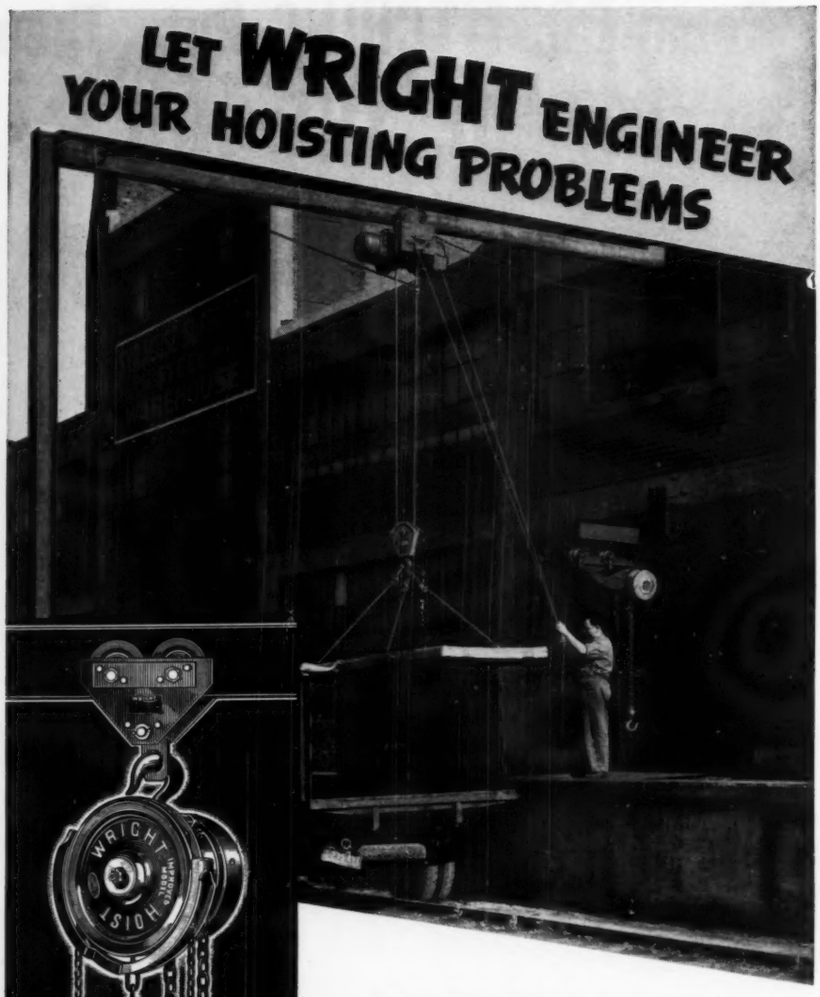
Name .....

Company .....

Address .....

My industry .....

11-41



● Regardless of whether your work demands an electric hoist, a hand-operated high speed hoist, traveling crane, jib crane, monorail trolley—whether it be a ¼ ton or a 50 ton job—Wright engineers know how to solve your problem—*economically*.

Aside from being fitted exactly to your needs you get three things in every WRIGHT HOIST:

1 • SAFETY. The load chain has a safety factor of 7 to 1 and its special process steel elongates 3" to the foot (under overload) before breaking. The bottom hook slowly opens to indicate overload, too.

2 • EFFICIENCY. WRIGHT HOISTS are fast, smooth and positive in action because of scientifically engineered design.

3 • DEPENDABILITY. WRIGHT HOISTS' rugged and precision design assures year-in and year-out durability and the very minimum of maintenance cost.

Write for your copy of the new Wright Catalog and learn the 21 points of superiority.

Let Wright engineer your hoisting and crane problems. Work through the Wright distributor in your city. You'll find him listed in the classified telephone book.

WRIGHT MANUFACTURING DIVISION
YORK • PENNSYLVANIA

ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
In Business for Your Safety

shut him up immediately with an objection, without going into the matter at all."

"Maybe," was Al's comment.

"Well," I asserted, "it looks to me as if Jim is pretty touchy about anything that originates outside of his office. He figures it's safest and least trouble to leave well enough alone. Seeing how things work out, the foremen take the same attitude, and not only make no suggestions but won't do their best to make Jim's ideas work out."

"That's one man's opinion," said Al.

Which, after all, is what it was.

British Industry in War

(*Continued from page 59*)

take from them many of their most cherished rights. He embarked on his task with both eyes open, but then Britain is fortunate in her sons. When she calls, it is hard for them to turn away.

In the meantime, the war against "consumer spending" went grimly on. All production of motor cars, except for military purposes, or export, had ceased practically from the beginning of the war. As for gasoline supplies to motorists, the government wasted no time in asking for personal sacrifices.

A very heavy horsepower tax was put on all cars while gasoline supplies were reduced to an average of 8 gallons a month for the smaller cars and 12 for the bigger ones. This has since been reduced. Supplies are only procurable by coupons.

Almost No Traffic

The result of all this has been a steady diminution of traffic which has become little more than a trickle. Garages closed down as their mechanics were drawn into armament production and repairs are practically impossible. It might take you eight months now to get your car mended after a good bump with another one. As for the tires, you had better go easy on them for no new ones are to be had.

The various brands of gasoline, after years of advertising their products, are now pooled. No longer do we ask for any brand of gasoline but take what we can get and are content that it has no name.

And just to add to the turn of the thumbscrew, the government brought in the highest purchase tax in history. This is not paid as an extra charge in the shops. It is paid by the wholesalers to the government and charged to the retailers. All the customer does

INVESTIGATORS FIND THESE 5 OUTSTANDING FEATURES in Blaw-Knox GRATING

Non-slip because of the twisted bar

Self-Cleaning no sharp corners to clog

Maximum open area for light and air

Easily maintained - paint reaches entire surface

Electroforged one-piece construction

Send for FREE paper weight size sample

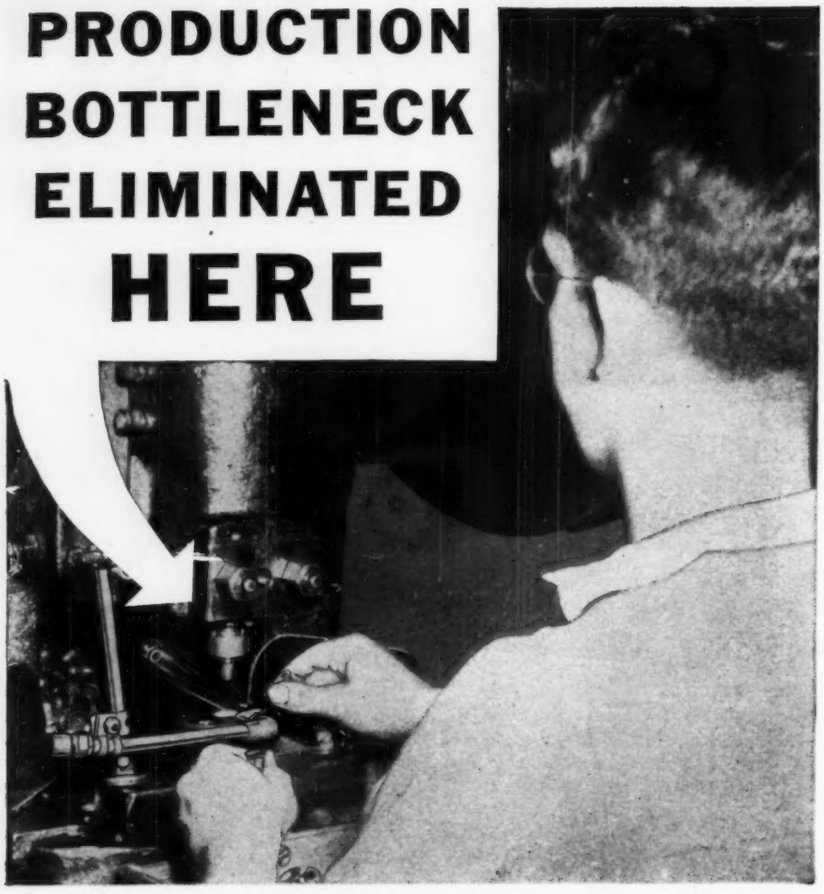
BLAW-KNOX DIVISION of Blaw-Knox Co.
2031 FARMERS BANK BUILDING, PITTSBURGH, PA.

NAME_____

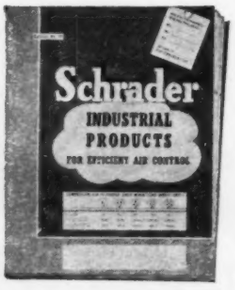
STREET_____

CITY_____ STATE_____

PRODUCTION BOTTLENECK ELIMINATED HERE



Removing work from press dies by hand is both slow and dangerous. Schrader Air Ejection Sets speed up the operation and eliminate the hazard. The results are increased production and improved operator efficiency. Installations of Schrader Air Ejection Sets actually step up the per unit output of a machine and provide the means of meeting immediately the demands for more production from your shop. Ask your local supplier about Schrader Air Ejection Sets and other work-producing equipment, or write to Schrader telling makes and types of your machinery.

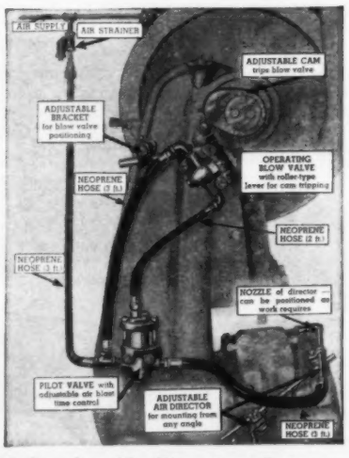


COMPLETE INFORMATION

Write for a copy of this 48-page Catalog and Service Manual showing what Schrader Air Controls and Equipment can do for you, and how it does it.

A. SCHRADER'S SON
470 Vanderbilt Avenue, Brooklyn, N. Y.
Division of Scovill Manufacturing Company, Incorporated

Schrader
REG. U.S. PAT. OFF.
AIR EJECTION SETS



Schrader Air Ejection Sets are made in complete sets for all types of presses, or can be made up to special requirements, ready for installation. Any millwright can hook them up.

is pay more, but the whole thing is included in the price.

Foodstuffs are exempt from this purchase tax, however. The political and humanitarian reasons for that decision need no underlining.

It will be gathered at once from this picture that the businesses not engaged in exports or war production are having a pretty thin time. Firms that had laboriously built up a good will over the years can no longer supply their product except in the smallest possible amounts, nor can they even keep their investments safeguarded by prestige advertising to hold their names before the public.

The newspapers have been cut down so heavily in newsprint that the big circulation dailies are down to four pages for most of the week. Since there is no radio advertising in Britain it will thus be seen that branded goods must hold their public purely on their merit and without the usual aid of advertisement.

In fact, there is an element of ironic humor in the combined tobacco distributors (who have not had to pool their products) issuing an appeal to the British public to smoke 20 percent fewer cigarettes.

From this it would be gathered that the exporters and munitions manufacturers would be doing well. Certainly the airplane and tank factories have none of the normal worries of peacetime production. The demand is limitless. No sales staffs are required, no promotion schemes. There is one gigantic purchaser, the British government, which, like Oliver Twist, asks for more—and then more.

Alas! for the shareholders in such factories, the low quotations of their common stock tell their own story. At the very beginning of the war an excess profits tax of 80 percent was introduced. The average of a period before the war was taken as a common denominator. Profits above that level came under the 80 percent tax.

As if this was not hard enough on the munitions and airplane factories which had kept going in the lean years, the government increased the tax to 100 percent. This was manifestly unfair. In my capacity as controller of aircraft factory cooperation under Lord Beaverbrook I came across airplane plants doing a turnover of ten or fifteen million pounds a year in which all but say a million pounds was being done at no profit for the shareholders.

About six months ago the government relaxed this harsh measure to the extent of reducing the tax to 80 percent but retaining the other 20 percent in the exchequer until the end of the war when each firm will be able to apply for repayment to assist

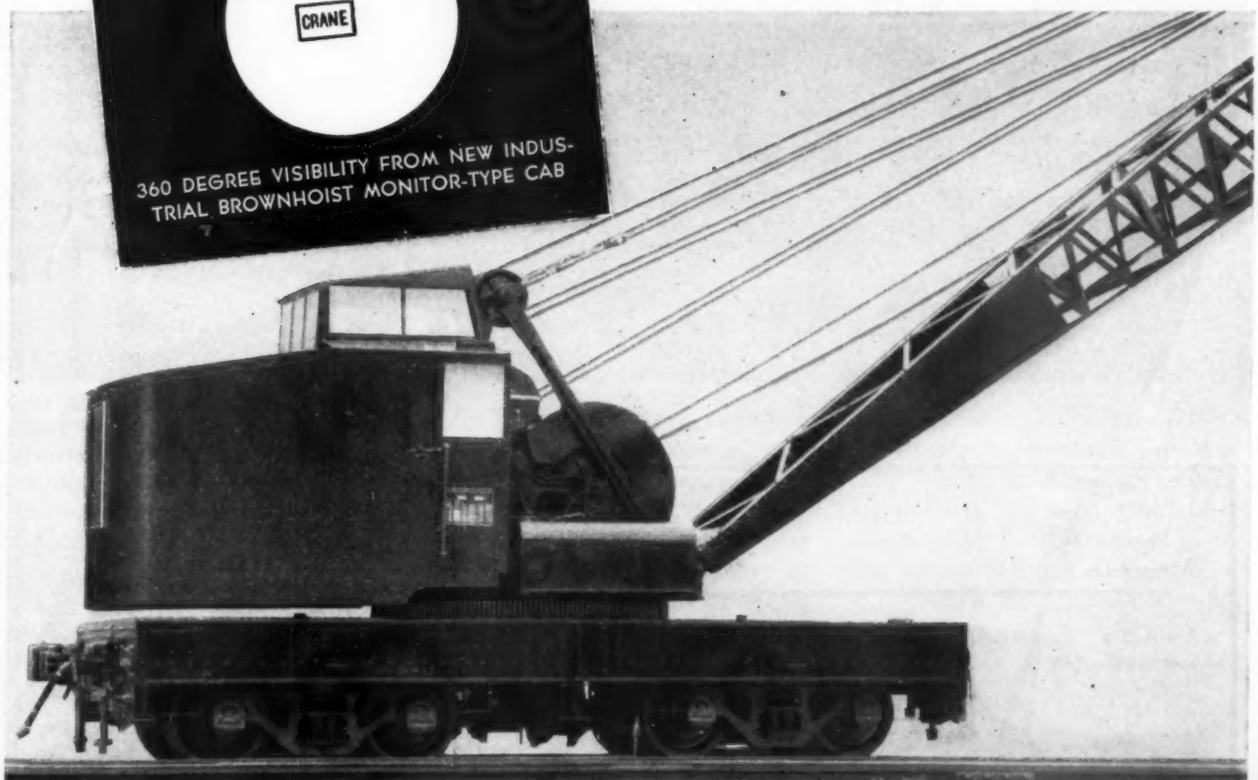
Clear Vision in Every Direction . . .

FROM PATENTED MONITOR-TYPE CAB ON I. B. CRANES . . .

As is clearly shown by the graphs at the left the Monitor-type cab on Industrial Brownhoist cranes increases an operator's area of vision from a partial sector clear up to 360 degrees. It is easy to realize how this great increase in visibility improves the operators efficiency. He can see in all directions at all times regardless of the crane's position. In addition to better visibility the Monitor-type cab provides better ventilation, less heat and less noise for the operator than the ordinary cab. Monitor-type cabs are standard on all I. B. gasoline or diesel locomotive cranes from 10 through 40 tons.

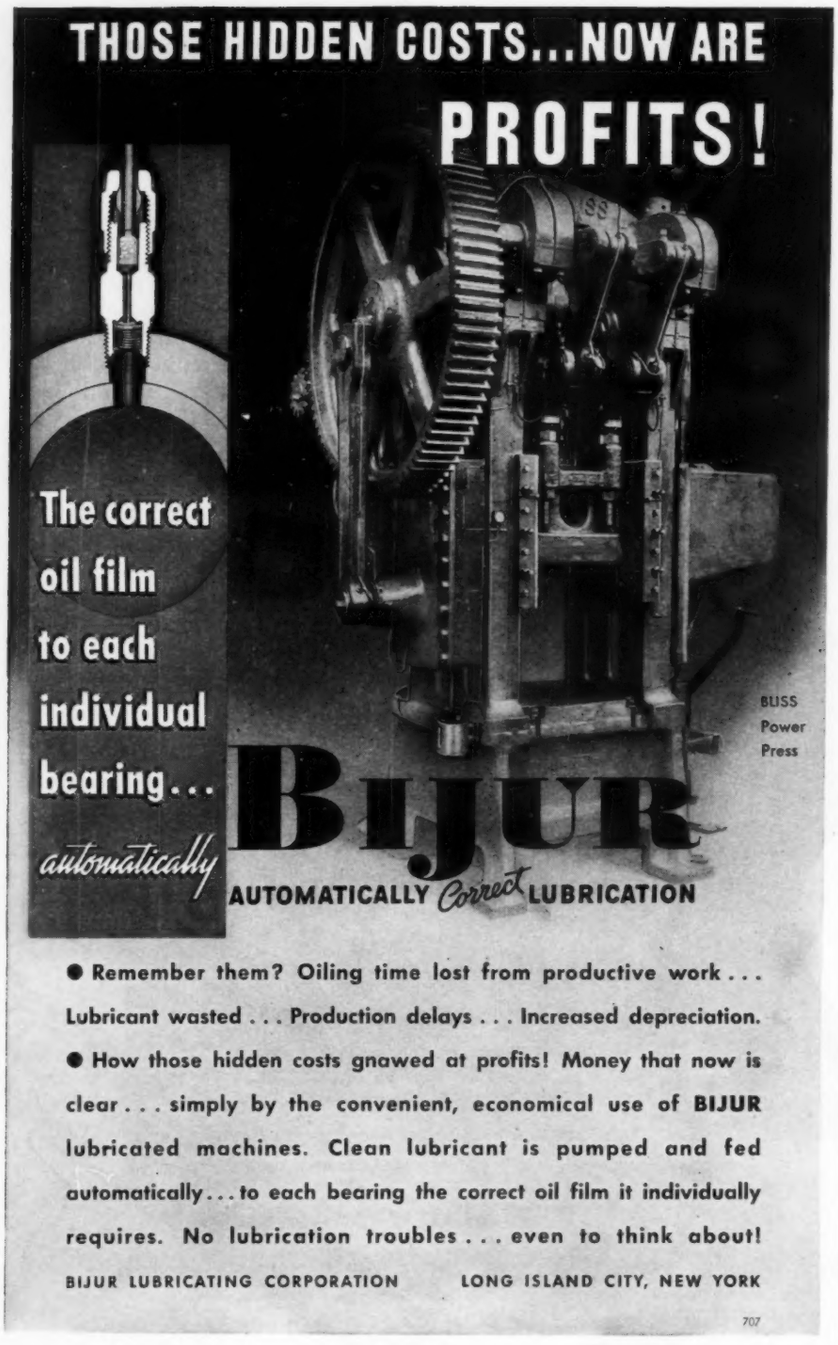
Scores of other features make I. B. locomotive cranes the choice of cost minded firms. Booms are designed for greater strength combined with a minimum of weight. Power plants develop more power and use less fuel than ever before. Undercarriages are built to the same standards as the heaviest railroad tenders.

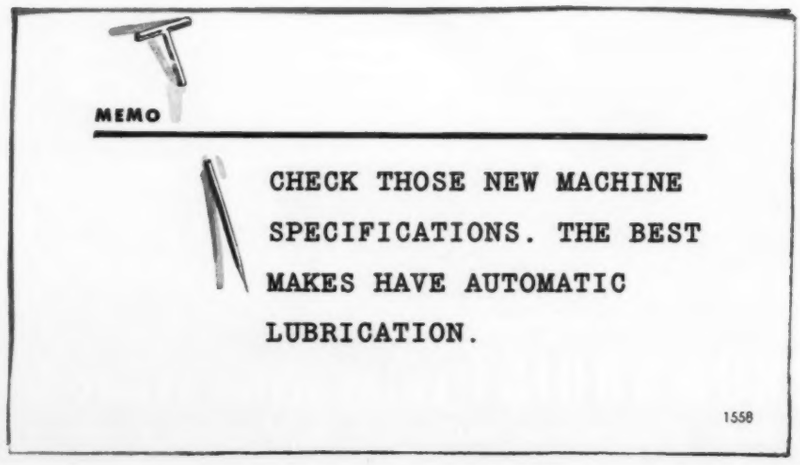
Because of their low operating cost, long life and all around efficiency, Industrial Brownhoist cranes do a better job of material handling. Write today for further facts.



INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES

GENERAL OFFICES: BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO


THOSE HIDDEN COSTS...NOW ARE
PROFITS!
The correct oil film to each individual bearing... automatically
BUSS Power Press
BIJUR
AUTOMATICALLY Correct LUBRICATION
● Remember them? Oiling time lost from productive work . . . Lubricant wasted . . . Production delays . . . Increased depreciation.
● How those hidden costs gnawed at profits! Money that now is clear . . . simply by the convenient, economical use of BIJUR lubricated machines. Clean lubricant is pumped and fed automatically . . . to each bearing the correct oil film it individually requires. No lubrication troubles . . . even to think about!
BIJUR LUBRICATING CORPORATION LONG ISLAND CITY, NEW YORK
707



in the turn-over to regular peacetime production.

But even this did not end the sacrifices that industry had to bear. Pursuing its ruthless but necessary policy of coordinating the national effort, the government introduced a plan which became known as the "Consolidation Bill." Where, for example, there were five factories in competition with one another for the domestic market or exports, these competitors had to merge, leaving one or perhaps two of the factories to carry on. The remainder would be turned over to war production, if possible, or to some other national use. If necessary, they would be closed. Again the harshness of this measure needs no amplifying. The customers of one factory would be supplied by its competitor. Even if the branded goods kept their identity, the customers had been handed over to deal with the personnel and the distributive machinery of the competitor plant.

But this is a pitiless, merciless war. No one in Britain is playing politics—and therefore no one is spared. Everyone realizes that personal consideration must give way to the needs of the State.

It is, however, in the production of war materials and airplanes in which the most significant and far-reaching changes have taken place. In fact, these are so fundamental that they are bound to have a profound influence on the whole future of the economic life of Great Britain.

At the commencement of the war the government took authority which gave it virtual power over everybody in the kingdom. Conscription was already in force before the war with its schedule of reserved occupations, but the wartime measure extended the power of the government over managements and men who would not come normally under conscription or reserved occupation.

I naturally saw more of the workings of this when I joined Lord Beaverbrook who took hold of the aircraft industry not so much as a Minister of the Crown, but as a super general manager. In the first few days of his regime he took their factories from two of the most famous industrialists in Britain. I do not mean that he confiscated them or stole the shares. What he did was to remove the men whom he thought incompetent and replace them with others—in some cases their direct competitors.

Again, one need not pause for effect. If Henry Ford turned up at the Chrysler factory and said he had been put in charge by President Roosevelt, one might have something of an American parallel.

The state had become not only an

No Time Out for Speed Changes

● Ability to change speeds quickly and accurately is contributing importantly to National Defense in thousands of manufacturing plants where machines are equipped with REEVES Variable Speed Control.

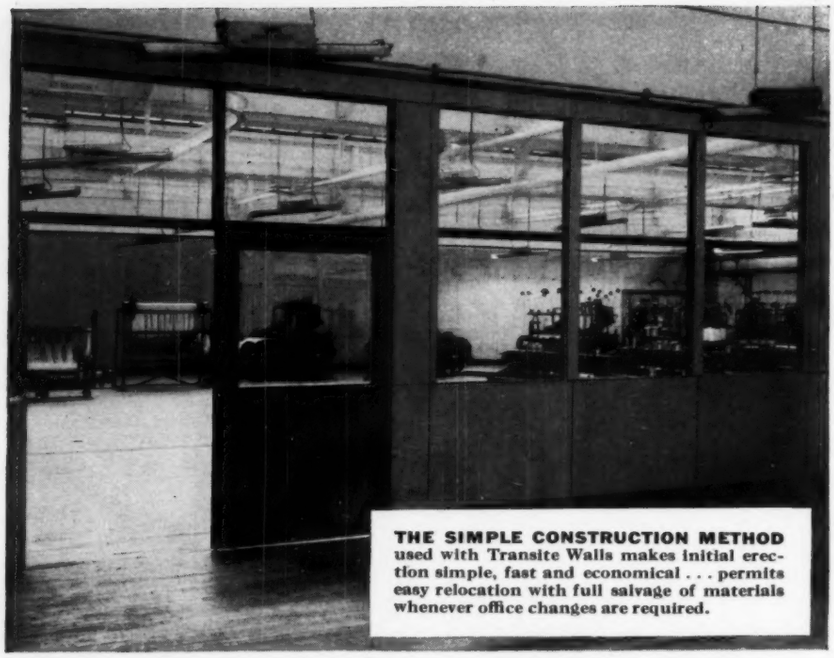
"Down time" is just as costly to the defense program when it occurs as the natural consequence of inadequate speed control, as it is when strikes or sabotage interrupt the flow of essential production.

We have no time to spare *now* for changing belts and gears, when speeds can be regulated by the simple operation of turning the REEVES handwheel, *without stopping the machine.*

If you have a machine in essential production which is "not doing its best" on account of inflexible speed operation, write, wire or phone us. We build so many different sizes of three basic speed control units that there will be no difficulty in selecting the one you need. Our entire organization is "on its toes" to assist in the big job American industry has to do.

REEVES PULLEY COMPANY
Department F **Columbus, Indiana**

Reeves
SPEED CONTROL



THE SIMPLE CONSTRUCTION METHOD used with Transite Walls makes initial erection simple, fast and economical . . . permits easy relocation with full salvage of materials whenever office changes are required.

When plant offices must be built *FAST*... use J-M TRANSITE WALLS

Easy to install, just as easy to relocate, these asbestos-cement partitions form solid, private offices . . . need little maintenance.

RAPID installation is an outstanding feature of J-M Transite Walls.

Made of asbestos and cement, these modern partitions are supplied in large, light sheets that mean easy, economical handling. A simple construction method cuts installation time far below that required for masonry walls. When alterations are necessary, this same method eliminates dirt and disturbance . . . permits fast relocation of single offices or entire departments. Yet offices are solid and private. And the asbestos-cement composition of Transite Walls provides durability and fire-safety . . . assures continued low maintenance.

• • •

Transite Walls are available in two types, Imperial and Universal. For details on both, send for brochure TR-22A. Address Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville

TRANSITE MOVABLE ASBESTOS WALLS

autocrat, but also a partner. Quite obviously airplane and tank factories, starved through the bad years and, unable to earn profits in war time, could not finance their own extensions. The money had to come from the government and it did so in an endless stream. Thus, in Coventry, Birmingham, and other centers, there will be three or four factories under one management with three owned by the firm and the other by the State.

When the change-over of peacetime comes, it will be interesting to see how far the State will be able to pull out or how far it will have to remain a partner.

At the present moment the State is the supreme employer, the sole importer, the controller of shipping and raw materials, as well as the universal banker. With the consent and even enthusiasm of the British people, the democratic country of Great Britain with a free press and a free Parliament has achieved a totalitarianism not far short of Germany herself. The basic difference is that in Britain it is done with the approval of the people who can throw out at any moment the government that is carrying it through.

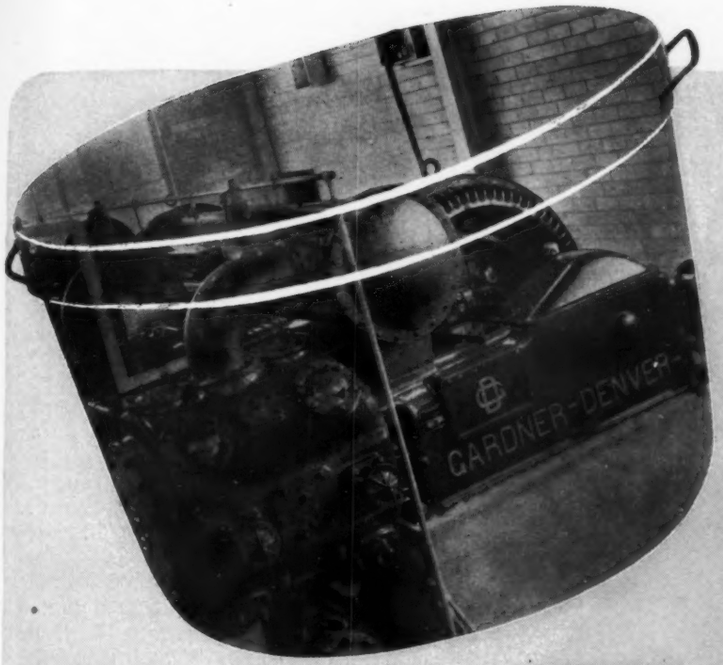
Not One Sweet Song

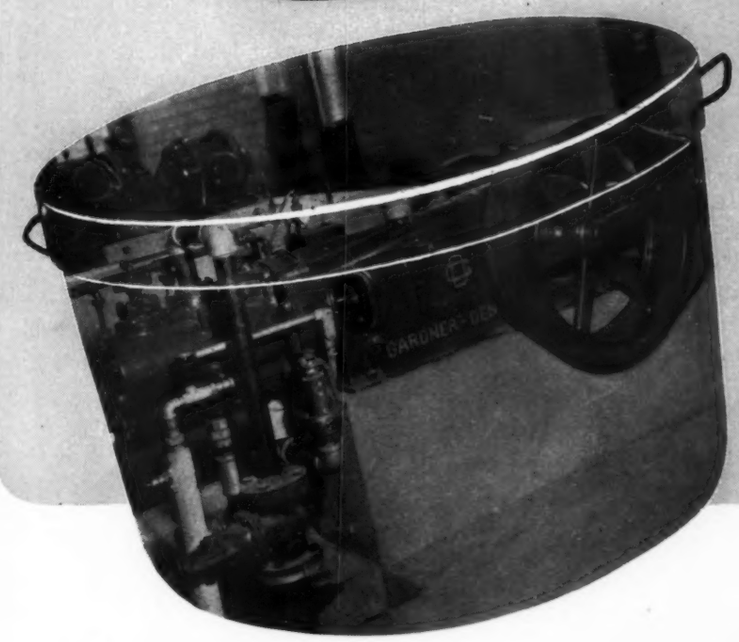
So far I have only dealt sketchily with the all-important subject of labor. It must not be thought that everything in connection with British labor has just been one sweet song. We have our minority of extremists, obstructionists, and communists who look upon the plight of the nation as their great chance, but, broadly speaking, the heart of British labor is sound, sober, and deeply patriotic.

As soon as the war effort really got going, the trade unions had to be asked for ever-increasing concessions. Women and girls had to be brought in by the tens of thousands on the principle that, wherever a man's job can be done by a woman, it should be done. This applies even in the British army now where women in uniform are releasing thousands of soldiers for the actual fighting units.

At first the men in the factories looked askance at the female intrusion and then accepted it with good humor. It was the same when many of the old pensioners came back. Nor was there any serious trouble when they were asked to work 12-hour shifts 7 days a week in that hectic period following the evacuation of Dunkerque and before the air battle of Britain.

I wonder what Blum's 40-hour-a-week French workers would have thought of the British on their 84-hour-a-week grind. It could not last, of course. Neither the human spirit nor the human body could stand it, but they kept at it long enough to give





IT'S *Full Measure* PERFORMANCE

That Makes Them Buy

Gardner-Denver "HA" two-stage air compressor — capacities from 468 to 1854 cu. ft. displacement per minute.

Gardner-Denver "HA" compressors are engineered for continuous heavy-duty performance. Their Timken roller main bearings provide the synchronous motor with an unchanging air gap for the entire life of the compressor. Valve breakage is practically eliminated by cushioned Duo-plate valves.

• • •

Gardner-Denver "RX" Horizontal Single-Stage Air Compressor — capacities from 89 to 1292 cu. ft. displacement per minute.

Dirt-free construction — cushioned Duo-plate valves that actually become lighter with use — positive lubrication — exceptionally smooth running — these are some of the reasons why Gardner-Denver "RX" compressors provide trouble-free service.

"OUR Gardner-Denver 'RX' compressor has operated day and night in the six months since its installation, and now has a total of 3740 operating hours—with no lost time whatever. We use this unit to provide air for all our stamping presses."

"We never had more than routine maintenance on our Gardner-Denver 'HA' compressor. Although it runs continuously 24 hours a day, 7 days per week, the roller main bearings have never been touched at any time."

* * *

These user reports are typical of the *full measure* performance which you get with Gardner-Denver "RX" and "HA" air compressors. They explain why, in these days of rush production, so many industrial plants are making G-D their first choice. For complete information about Gardner-Denver "HA" and "RX" Compressors, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

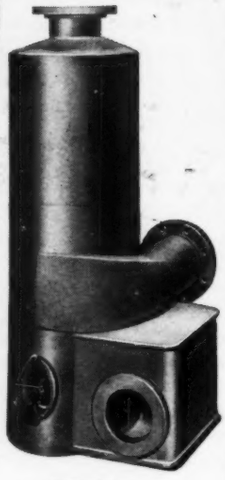
Since 1859

SUB-CONTRACT

Your Sheet Steel and Plate Work to

KIRK & BLUM

SAVE MEN MACHINES—SPACE



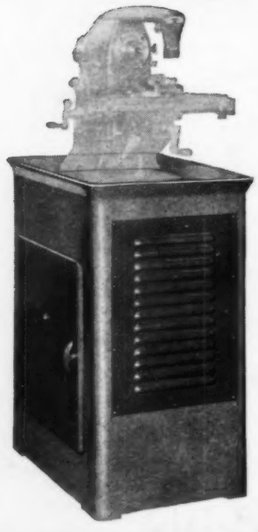
Many manufacturers have found that this service actually pays them a profit—by releasing men, machines and valuable space needed for other important work—by helping them meet urgent delivery dates. Investigate the advantages of this service, as applied to your problems. Send us your drawings for prompt quotations.

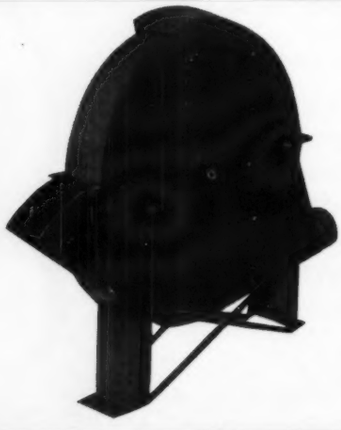
We fabricate Stainless (all types) Aluminum, Monel, Brass, Copper, Angle and Bar Shapes.

SPEED DELIVERIES

KIRK & BLUM SERVICE INCLUDES:

Shearing, punching, bending, stamping, pressing, welding, forming, rolling, wiring, edging, hammering, flanging, beading, riveting, assembling.





THE KIRK & BLUM MFG. CO.

2835 SPRING GROVE AVE. CINCINNATI, OHIO

the RAF the best machines ever produced and to claim their honorable share in the defeat of the Luftwaffe.

Even then, a certain amount of trouble came from the small but noisy communists. They had a newspaper called the *Daily Worker* which had performed some strange acrobatics. In the months preceding the war it called for the destruction of Hitler. Then when Stalin made his deal with the Fuehrer and the war began, the *Daily Worker* denounced the war as an Imperialist racket. In fact it did everything possible to impede the national effort, playing up soldiers' grievances and giving publicity to every outbreak of trouble in the factories.

These efforts were aided and abetted in many cases by shop stewards in the factories posing as the legitimately elected representatives of the workers and fomenting minor troubles into big ones. As a journalist I detest any interference with the press, but the *Daily Worker* went so far that I led the movement for its suppression in the House of Commons. In due time it was banned. Now with Russia in the war it promises to behave, but we are unlikely to give a second chance to a newspaper that bases its loyalty upon the fluctuating policy of a foreign power.

On the whole, though, British labor has proved sensible, patriotic, and patient. It has virtually given up the right to strike and is not trying to profiteer. Wages are higher, undoubtedly, but labor itself realizes the insanity of attaining a wartime level that will only mean chaos when peace comes.

There is no such cleavage as in the last war between the man in uniform and the man in overalls.

Women in Industry

Industrial conscription of women is virtually in existence. It has gone only so far as compulsory registration, but that is only one step behind conscription. In its working out it will be considerate and will take into account the human and domestic factor. The nation would not have it otherwise.

If this picture of Britain at work in wartime seems bleak and harsh, you must remember that there is no longer any attempt over there to conduct this struggle half at war and half at peace. That is the will of the people carried out by the representatives of the people.

Nor has it changed the temperament of the average Britisher and his wife. They still laugh and they still enjoy life—perhaps all the more because they feel that either by their sacrifices or their efforts they are helping the nation to victory.

THE NEW Dayton V-BELT

WITH PATENTED FLAT COG CONSTRUCTION

TESTS PROVE: 21% GREATER PULLING POWER 22% LONGER LIFE

Yes, it's the *extra value* V-Belt . . . it's the V-Belt with patented flat cog construction that's built for both V-to-V Drives and V-Flat Drives! Only this new V-Belt has Dayton's non-skid tire tread design to increase traction and pulling power on *flat* pulleys, PLUS Dayton's die-cut raw edges for a more powerful grip on *grooved* pulleys.

And that isn't all. Only this new Dayton V-Belt has the stronger, heat-resistant Daytex Cord in the neutral axis section—and Dayton's "Built-to-Bend" construction—exclusive features which mean that Daytons run cooler and last longer under the strain of constant high-speed flexing.

Tests prove that this revolutionary V-Belt on flat pulleys of a V-Flat Drive has more than 21% greater pulling power—and laboratory and field tests show that on grooved pulleys this V-Belt has an overall increased life of at least 22%.

This new V-Belt, with its added performance and unmatched economy, is but another achievement in Dayton's 21 years of V-Belt pioneering. *Yet it costs no more!* Write for complete information and engineering data.

The Dayton Rubber
MANUFACTURING COMPANY, DAYTON, OHIO
The World's Largest Manufacturer of V-Belts
DAYTON, THE GREATEST NAME IN V-BELTS

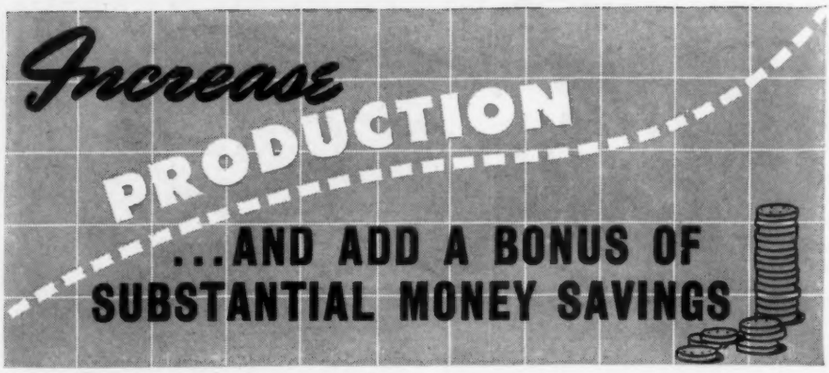
BUILT-TO-BEND FEATURE AND DAYTEX CORD mean longer life under constant high-speed flexing.

FLAT COGS AND DIE-CUT SIDES provide greater gripping power on grooved pulleys and on flat pulleys.

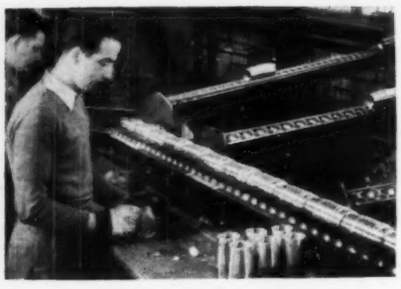
CROSSWISE RIGIDITY prevents distortion—assures maximum efficiency and longer belt life.

Dayton
V-BELTS
WITH PATENTED COG CONSTRUCTION
THE SAME BELT FOR V-FLAT DRIVES FOR V-TO-V DRIVES

Copyright, 1941, The Dayton Rubber Mfg. Co.



Standard Conveyor engineers, through sound recommendations, based on more than thirty years of conveyor experience throughout industry, have helped hundreds of manufacturers to make man-power and man-hours more productive. Typical installations like those described below give you an idea of what Standard Conveyor engineers may be able to do for you:



PROMINENT FOOD MANUFACTURER REPORTS:

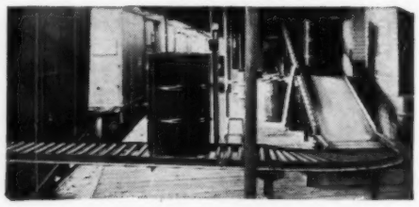
". . . one of the greatest time and labor-saving devices we have ever used—paid for itself in less than 12 months."

ARMAMENT PRODUCTION:

Standard Conveyors used in large plant for fast, safe "line" production of 3 inch A. A. shell.

OIL REFINERY SAVES FIRST INVESTMENT

in Conveyors—$6,501 A Year. ". . . new equipment must justify itself within first year . . . the conveyor has paid for itself within that time. Additional conveyors have been purchased each year since first conveyors were installed."



Booklet Shows Conveyor Applications and Possibilities

Send for booklet FM-11 "Conveyors by Standard"—a valuable reference book on conveying and conveying methods—contains many installation pictures representing practically all industries—suggests type of conveyors best suited to particular products and commodities.

STANDARD CONVEYOR COMPANY

General Offices: North St. Paul, Minn.

Sales and Engineering Offices in Principal Cities

FIRST FOR FASTER PRODUCTION

"THE STANDARD OF VALUE"

Standard CONVEYORS

BOOKS

MANAGEMENT AND MORALE

F. J. Roethlisberger, associate professor of industrial research, Graduate School of Business Administration, Harvard University. Harvard University Press, Cambridge, Mass. 194 pages. $2.

An attempt to clear up confusion in social sciences and the fields of personnel and labor problems, and an effort to establish "cooperative phenomena" as a field for serious, scientific research.

HANDBOOK OF SLEEVE BEARINGS

Albert B. Willi, chief engineer, Federal-Mogul Corp., Detroit. Drawings, charts, tables, photographs. Available to persons directly concerned with sleeve bearing installations.

A practical guide for engineer, designer, and draftsman in the selection, design, and application of sleeve bearings.

PROBLEMS AND POLICIES IN INDUSTRIAL RELATIONS IN A WAR ECONOMY

Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. 28 pages. 25c.

Third supplement of selected references from United States and foreign sources, to industrial relations problems in a war economy.

ACCOUNTING FOR ENGINEERS

John R. Bangs, M.E., professor and head of department of administrative engineering, and George R. Hanselman, M.E., M.S., associated professor of administrative engineering, Cornell University. International Textbook Co., Scranton, Pa. 532 pages, tables, figures, appendix, index.

Designed to serve as a basis for a 15-week course for engineering students, to supplement instruction in industrial and administrative engineering, and as a basis for instruction for a one-semester course for non-engineering students. Part I is devoted to the theory of debit and credit; Part II shows procedure at the end of a fiscal period; accounting practice is discussed in Part III; and accounting applications and costs are the themes of Parts IV and V. Financial statements of several outstanding companies are included.

TRUE STEEL

Christy Borth. The Bobbs-Merrill Co., Indianapolis. 319 pages, photographs, index. $3.

Biography of George Matthew Verity, chairman of the board, American Rolling Mill Company—the son of a Methodist circuit rider who, starting without capital or special equipment, became a great steel executive. Not only the story of the man, but also the history of a company and an industry.

THE DEVELOPMENT OF AMERICAN INDUSTRIES

Edited by John George Glover, M.C.S., Ph.D., associate professor of management, and William Bouck Cornell, M.E., professor of management, School of Commerce, New York University. Prentice-Hall, Inc., 70 Fifth

INCREASED SPEED PLUS
SMOOTH, UNIFORM,
HIGH QUALITY WELDS
.....with

AIRCO No. 81 ELECTRODE

Heavy ring being welded with Airco No. 81 Electrode using Wilson Hornet Arc Welder. Photograph courtesy of Louisville Drying Machinery Company.

Accelerate production — speed up the welding of frames, tanks, pressure vessels, pipe and structural members with Airco No. 81 Electrode. This high-speed, mild steel electrode is designed especially for making single pass horizontal fillets on ¼" and heavier steel, and single or multiple pass flat positioned fillets. Highly satisfactory results are also obtained with Airco No. 81 when welding "V" or "U" grooved sections. The heavy slag of this shielded arc electrode affords ample protection, floats dirt and other foreign matter from the weld. Yet, after cooling, the slag is practically self-removing.

Weld deposits of Airco No. 81 Electrode exceed requirements of the specification for classification E 6020 filler metal by the A.W.S. and A.S.T.M. They regularly develop tensile strengths of 63,000 — 70,000 p.s.i. and elongations in 2 inches of 28% — 32%. Airco No. 81 Electrodes are readily available from any nearby Airco stockroom or distributor. So be sure to order a supply today.

Air Reduction

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y.

IN TEXAS
MAGNOLIA-AIRCO GAS PRODUCTS CO.
AIRCO DISTRICT OFFICES IN PRINCIPAL CITIES

AIRCO — WILSON

Anything and Everything for GAS WELDING or CUTTING and ARC WELDING

TIME FOR TICONDEROGA

When "the heat's on" it's time for
Ticonderoga Flake Lubricating Graphite

Keeps lubricating long after heat—pressure—solvents break down other lubricants.

Impregnates wearing surfaces with a durable lubricating film —insurance against bearing damage.

Adds stamina to oils, greases.

With production stepped up—maintenance rushed—personnel hard-put—rely on Ticonderoga.

Particle Size No. 1—large, lubricous flakes.
Particle Size No. 2—finely divided flakes.
Dixon's No. 635—minutely subdivided, powdered flakes.
Dixon's Microfyne—microscopically subdivided particles.

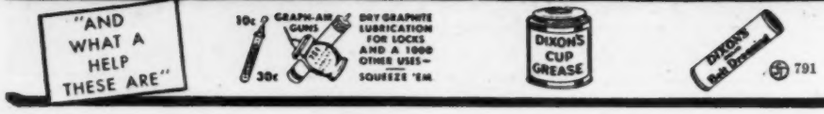
PERFECT PIPE JOINTS . . . *QUICKER*

Threaded, gasketed and flanged pipe and other joints can be set up tighter, quicker with Dixon's Pipe Joint Graphite Compound and Dixon's Graphite Seal. They stay tight yet lubricated —easy to take apart a day or a year hence.

Use the "Compound" for steam, air, water, acids, alkalies —the "Seal" for oils, greases, other non-aqueous solvents.

Write for Booklet DS-44.

JOSEPH DIXON CRUCIBLE CO.
Jersey City, New Jersey



Ave., New York. 1,005 pages, drawings, photographs, charts, tables, index. $5.50.

History of 41 industries in the United States, each written by or under the direction of an expert in the field. A revised edition, brought up to date, of book first published in 1932.

THE SWEDISH COLLECTIVE BARGAINING SYSTEM

Paul H. Norgren, assistant professor of economics, Worcester Polytechnic Institute. Harvard University Press, Cambridge, Mass. 339 pages, tables, index. $3.50.

Devoted to making available to Americans who are interested, Swedish experience in the bargaining between trade unions and employers' organizations that determines wages and working conditions in Sweden. In five parts: I. The Development of Workers' and Employers' Organizations; II. The Collective Agreements; III. The Agreement Making Process; IV. Bargaining Within the Agreement Framework; and V. Conclusion.

MOTION STUDY

Herbert C. Sampter, Ph.B., factory manager, Blaisdell Pencil Co., Pitman Publishing Corp. 2 W. 45th St., New York. 152 pages, forms, charts, photographs, index. $1.75.

Simple, concise statement of the basic principles of motion study as a whole, with the emphasis on the use of flow charts. Included are chapters headed: "Over-all Motion Study;" "General Motion Study;" "Working Area;" "Operation Charts;" "Therbligs;" "Micromotion Study;" "Safety and Fatigue;" as well as an introduction devoted to history and development of motion study.

STATIC ELECTRICITY

National Fire Protection Association, 60 Batterymarch St., Boston. 50 pages. 35c.

Report of the committee on static electricity, tentatively adopted at the 1941 annual meeting of the National Fire Protection Association. Includes "Theory of Static Electricity," "Processes Where Static Electricity Is a Hazard," "Workmen Hazards," "Prevention of Static Accumulations," and "Instruments for Detecting, Measuring, and Recording Static."

GUIDE TO LIBRARY FACILITIES FOR NATIONAL DEFENSE

Edited by Carl L. Cannon for the Joint Committee on Library Research Facilities for National Emergency. American Library Association, 520 N. Michigan Ave., Chicago. 448 pages. Available for reference in libraries only.

Revised edition. Results of an intensive survey of facilities of American libraries to supply information pertinent to national defense. Arranged by broad subjects in alphabetical order, then by states and institutions that have library facilities.

EFFECTS OF THE DEFENSE PROGRAM ON PRICES, WAGES, AND PROFITS

Meyer Jacobstein and Harold G. Moulton. The Brookings Institute, Washington, D. C. 43 pages, tables. 25c.

Pamphlet No. 29. Shows changes that have occurred in the price of commodities since the outbreak of the European war and the beginning of the defense program, and the effect these changes have had on the economic position of major groups in this country. Chapter headings include: I. The Increase in National Production and Income;

THESE feet stand on factory floors all day long. They know what fatigue is . . . and they know it's the floor that causes most of it. *You* know what fatigue does to production. That's why it's highly important that your factory floors provide comfort underfoot, as well as safety, durability, and the many other desirable floor features which modern efficiency standards demand.

Armstrong's Industrial Asphalt Tile *made by a flooring manufacturer*, gives you these features at a most reasonable cost! In fact, it offers a balanced combination of desirable qualities unmatched by *any* other industrial flooring material! Your workers will suffer less fatigue. They will be safer, too, because Armstrong's Industrial Asphalt Tile is nonskid even when wet, splinterproof, nonsparking, free from glare, and not damp.

Production will speed up for other reasons, too. This modern flooring has a smooth, firm, fast-trucking surface, yet it provides ample traction even on ramps. Maintenance is kept at a minimum because Armstrong's Industrial Asphalt Tile is easy to clean and extremely durable. It won't dust, crack, chip, or spall, and it has unusual resistance to indentation from both live and dead loads and to abrasive wear. This flooring is also self-healing, and it actually improves with use. Individual blocks are easily replaced if they should be seriously damaged.

Four sizes, four thicknesses, and both plain and marble colors are available. Installation is quick and inexpensive. You'll find complete facts in a new folder which will be sent on request. Just clip the coupon to your letterhead and mail to Armstrong Cork Company, Resilient Tile Floors Department, 1242 State St., Lancaster, Pennsylvania.

ARMSTRONG'S FLOORS
INDUSTRIAL ASPHALT TILE

ARMSTRONG CORK COMPANY
Resilient Tile Floors Department
1242 State Street, Lancaster, Pa.

Gentlemen:

Without obligation, please send me my copy of the new informative booklet on industrial flooring.

Name.....

Firm.....

Address.....

YOU ARE NOW facing an entirely new set of materials handling and product washing problems.

To keep shells and cartridges flowing in an endless stream, you need this new type A-F conveyor system. (Notice the concave rollers).

To wash, rinse and dry shells, cartridges, gun barrels and other defense products efficiently and more economically, we have produced new types of efficient machines never dreamed of before the present emergency.

Whatever your materials handling or product handling problem — whatever your product washing problem — our engineering staff, backed by 40 years of producing "scientifically planned" equipment, can help you to greater efficiency and lower costs.

Write, wire or phone, without obligation on your part, for a discussion of your defense production problems — or for new, illustrated catalogs, featuring A-F Scientifically Planned Conveyors and Industrial Washing Machines for endless stream production — today.

The Alvey-Ferguson Co.,
115 Disney St., Cincinnati, O.

CONVEYING A-F MACHINERY
ALVEY-FERGUSON
INDUSTRIAL WASHING MACHINES
AND Conveyors

11. Who Shared in the Increased Income; III. What Has Been the Effect of the Defense Program Upon Prices?; IV. Explanation of the Price Advances; V. Some Issues Clarified.

GRIEVANCE PROCEDURES

Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. 8 pages. 20c.

Digest of current practice based on material received from a large number of representative companies. Includes page of references.

•

ON THE CALENDAR

NOVEMBER

5–6, American Conference on Industrial Health, Second Annual Meeting, Chicago. A. D. Cloud, Editor, Industrial Medicine, 540 North Michigan Ave., Chicago.

6–8, Industrial Management Society, Fourth Annual National Time and Motion Study Clinic, Chicago. C. S. Becker, Chairman of Publicity Committee, 205 West Wacker Drive, Chicago.

12–13, Industrial Hygiene Foundation of America, Inc., Sixth Annual Meeting, Pittsburgh. John F. McMahon, Executive Secretary, 4400 Fifth Ave., Pittsburgh.

19–20, American Management Association, Production Division, Pittsburgh. H. J. Howlett, Secretary, 330 West 42nd St., New York.

28–29, American Leather Belting Association, Annual Meeting, Atlanta. E. R. Rath, Executive Manager, 53 Park Row, New York.

DECEMBER

1–5, American Society of Mechanical Engineers, Annual Meeting, New York. C. E. Davies, 29 West 39th St., New York.

1–5, Congress of American Industry, New York. Walter D. Fuller, President, National Association of Manufacturers, 14 West 49th St., New York.

1–6, Exposition of Chemical Industries, Biennial Meeting, New York. Charles F. Roth, Manager, Grand Central Palace, New York.

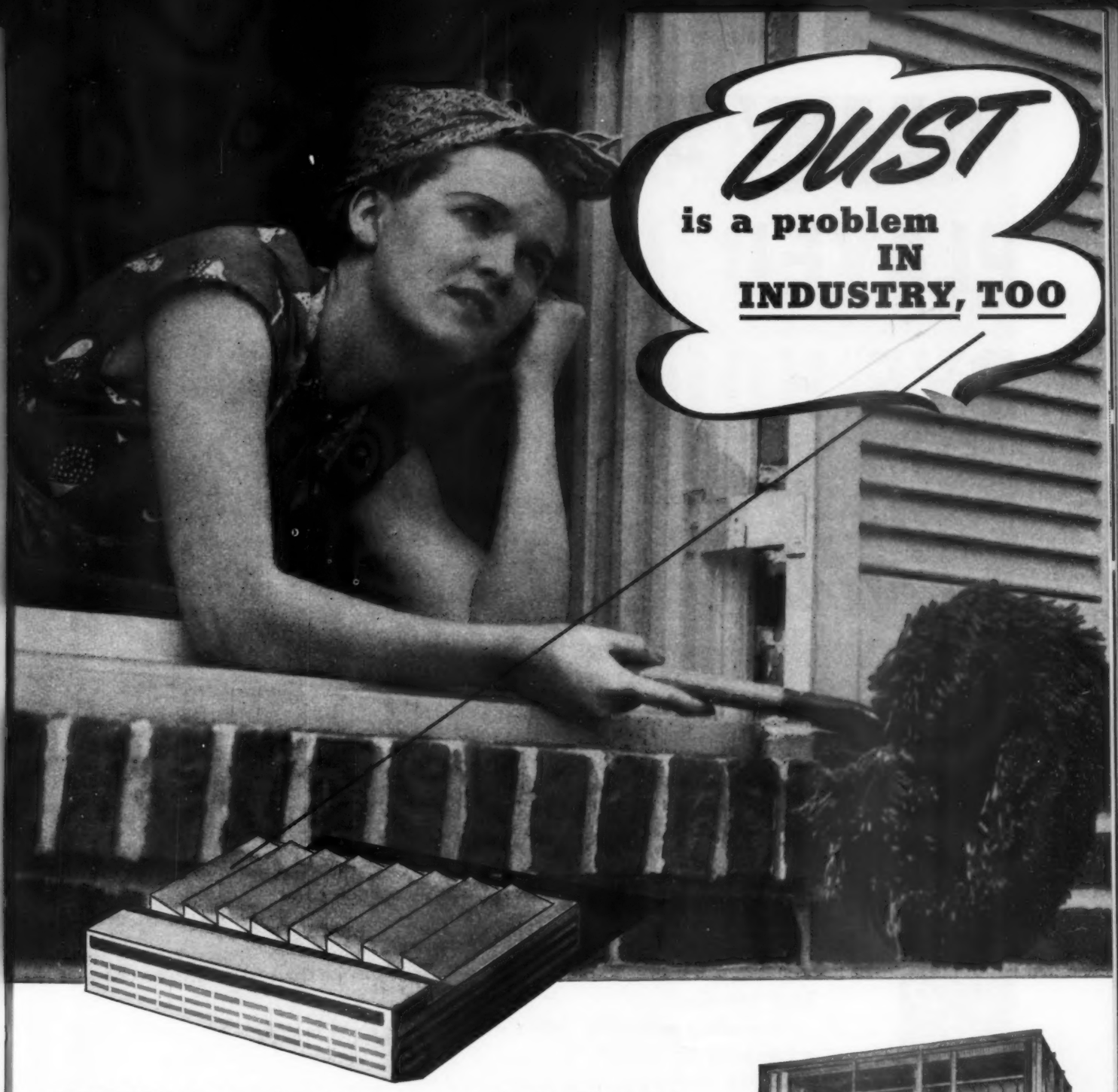
3–5, National Association of Manufacturers, Annual Meeting, New York. Noel Sargent, Secretary, 14 West 49th St., New York.

4, National Association of Fan Manufacturers, New York. L. O. Monroe, Secretary, 5-208 General Motors Building, Detroit.

JANUARY

26–30, American Institute of Electrical Engineers, National Convention, New York. H. H. Henline, National Secretary, 33 West 39th St., New York.

26–30, American Society of Heating & Ventilating Engineers, 48th Annual Meeting, Philadelphia. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.



INDUSTRY has its problems of dust, too. And American Blower has the answer to most of these problems — simple practical Dust Collectors and Precipitators to eliminate nuisance dust and reclaim valuable materials — and efficient, effective Air Washers and Capillary Washers to clear the air for industrial processes.

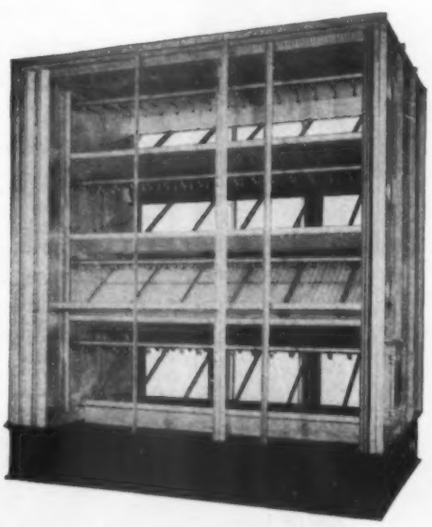
Whatever your dust problem may be—American Blower engineering dust laboratory and manufacturing facilities are at your service. Phone or wire the nearest American Blower Branch Office or write for complete data today!

Remember . . . Bad Air Is Bad Business!

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, 6000 Russell Street, Detroit, Mich.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
Division of American Radiator and Standard Sanitary Corporation

DUST COLLECTORS • DUST PRECIPITATORS • FANS • BLOWERS • AIR WASHERS



For tough jobs—new American Blower Capillary Air Washers — compact, high efficiency washers for air cleaning, humidifying, cooling and dehumidifying in air conditioning and industrial process work.

"HEAVY STARTING LOADS PLAYED 'HOB' IN OUR DYE HOUSE . . .

—but not since we Cloth Dryer

THE FACTS: "Last May (1940)," continues Mr. Eisenhart, "we installed a cloth dryer in our dyehouse. The manufacturer had equipped the machine with 100 ampere, 250 volt fused switches and 100 ampere renewable fuses.

"Heavy starting loads, however, played 'hob' as the fuses on the machine kept blowing.

"Knowing about the long time-lag feature of BUSS fuses proved to be a lifesaver for us — for as soon as we replaced the other fuses with BUSS fuses we stopped having these starting shutdowns."

WHY LET USELESS SHUTDOWNS COST YOU MONEY—WHEN YOU CAN PREVENT THEM?

It is easy to see that useless shutdowns cause a real money loss. Stalled machines, idle workers and interrupted production don't pay dividends.

Doesn't it become a matter of executive importance, therefore, to select fuses that will do their part to reduce to a minimum all needless interruptions of electrical service?

BUSS

Why hold up Construction?

You can have PC *Glass Blocks right now!*

YOU can speed up construction by building with PC Glass Blocks. There's no waiting, for we have ample stocks of blocks on hand for immediate delivery.

Glass blocks not only save time—they also provide many other important advantages. Glass blocks flood your building with daylight. They can economically be used in large panels, because they provide more than twice the insulation of ordinary windows.

PC Glass Blocks help reduce maintenance costs. A panel of blocks is all glass and mortar—there's nothing to rot or corrode—nothing to repair or replace. Cleaning is a quick, simple job, for the panels are smooth glass surfaces, with no muntins to wipe dry.

It will pay you to consider how the combined light-transmitting and insulating properties of PC Glass Blocks can help you cut costs and improve product uniformity. We can help you choose the right type of blocks for your plant—help you fit them into your plans for either new construction or remodelling. Our 20-page book shows how PC Glass Blocks have been used successfully in many plants. Gives you much valuable information on light-transmission, insulation, condensation, and other important data. Mail the coupon below for your copy of this book. It's free, of course.

The Right Block for every Daylighting Problem

Do your workmen face glaring light from windows? Do you need a better-diffused daylight for precision work? Are workmen located far from outside walls getting too little daylight? These are just a few of the problems that PC Glass Blocks can solve. PC Glass Blocks are made in a wide variety of patterns, each designed to perform a specific lighting job. Generally, these blocks fall into three classes:

Semi-Diffusing Blocks — designed to provide high light transmission, with a good diffusion for general use. Some patterns are designed with special attention to high obscurity.

Diffusing Blocks — made with a Fiberglas screen inserted in the block. This provides maximum diffusion—the ideal type of block to use on sunny exposures and where workmen face the block panels. High obscurity and reduced heat transmission.

Light-Directing Blocks—designed to direct the greater part of the transmitted light upwards to the ceiling, from which it is reflected downwardly to areas far within the room. Provides a more even distribution of daylight throughout the room.

"PITTSBURGH" stands for Quality Glass

PITTSBURGH PC CORNING

GLASS BLOCKS

Distributed by

PITTSBURGH PLATE GLASS COMPANY

and by W. P. Fuller & Co. on the Pacific Coast

Pittsburgh Corning Corporation
2027-A Grant Bldg., Pittsburgh, Pa.

Please send me your free, illustrated book that tells how to use PC Glass Blocks.
☐ for factories; ☐ for commercial and public buildings; ☐ for homes.
(Be sure to indicate type of building)

Name_____

Address_____

City_____ State_____

ASE
SHOP EQUIPMENT

IMPORTANT TIME SAVERS ON PRODUCTION LINES

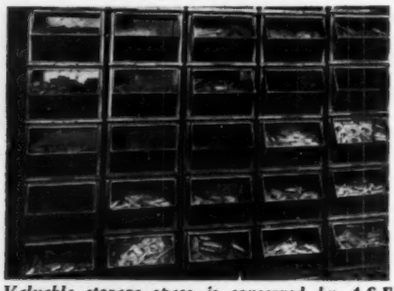
SPEED is essential in this great production drive. Time-saving A-S-E Shop Equipment is helping manufacturers accomplish that aim. Shop Boxes are helping break bottlenecks—by keeping small parts moving in production and in assembly—by making valuable storage space available for other purposes—by saving valuable production minutes in many ways, in many parts of the plant.

FOR HANDLING AND STORING OF SMALL PARTS

A-S-E Stacking Box

A-S-E Stack-Units and Stacking Boxes are designed for speed and efficient handling of small parts in production and assembly. Made of steel, they are resistant to fire dangers, and they are able to stand up under hard use where ordinary boxes would break down. They can be stacked as high as desired without danger of telescoping or becoming unstacked by vibration. Parts are always right at hand where they are needed. Of uniform size and shape they do not stick out in the aisles or detract from the appearance of a well-kept shop.

Write for the new A-S-E Catalog —showing how many concerns have solved their small parts handling and storing problems easily and economically.



Valuable storage space is conserved by A-S-E Stack-Units

GET THE FACTS TODAY!

ALL-STEEL-EQUIP COMPANY, Inc.
411 JOHN STREET
AURORA • ILLINOIS

THEY SAY AND DO

Farmer Jury Convicts 14 CIO Members

An interesting sidelight on public reaction to current labor unrest was brought out by the recent conviction of 14 members of CIO on charges of resisting the police during a strike disturbance at Richmond, Ind.

Eleven farmers and a garage mechanic made up the jury that levied $100 fines and costs on all 14 defendants and imposed jail terms of 90 days on two of the leaders and 60 days on the 12 others. Local reports laid stress on widespread farmer antipathy to labor disputes, heightened by the fact that the unionists are members of the Farm Equipment Workers Organizing Committee. As such they are viewed as factors tending to delay the production and increase the price of farm equipment.

The month-long trial resulted from a riot outside the Richmond plant of the International Harvester Company on March 27 when police attempted to assist non-union workers through picket lines. In the fighting which followed more than 20 persons were hurt.

In addition to the 14 defendants convicted, 23 others were acquitted of the same charge. Powers Hapgood, CIO Indiana Regional Director, announced that an appeal would be taken immediately to the Indiana Supreme Court.

•

Motion Pictures Widely Used in Worker Training

Motion pictures—their greatest value is obviating long plant tours—are being used extensively by the United States Steel Corporation in the training of thousands of workers for national defense jobs.

Each month, more than 3,000 men in classrooms, factories, and arsenals study the details of steelmaking through the medium of United States Steel films. Other companies carrying on employee training programs, as well as state and federal agencies supervising the development of skilled workmen, are making use of some of these films, which are offered without charge to responsible borrowers by the Corporation. In the first seven months of this year, more than 1,870,000 persons saw these films. Most popular of the releases is the 7-reel feature, "The Making and Shaping of Steel."

Film distribution centers of the Corporation and its subsidiaries may be reached through: C. R. Moffat, director of advertising, United States Steel Corporation of Delaware, 436 Seventh Ave., Pittsburgh; A. C. Wilby, assistant to vice-president, United States Steel Corporation of Delaware, 208 South La Salle St., Chicago; Robert T. Dalton, advertising department, United States Steel Corporation of Delaware, 71 Broadway, New York; Le Roy Holt, sales promotion director, Tennessee Coal, Iron, & Railroad Company, Brown-Marx Building, Birmingham, Ala.; W. H. Cordes, manager, sales promotion, American Steel & Wire Company, Rockefeller Building, Cleveland; and J. B. Du Prau, director, Commercial Office, Columbia Steel Company, Russ Building, San Francisco.

•

Employment of Women Rises in Defense

The last few months have seen a decided further increase in the employment of women in unaccustomed industrial jobs, says the Federal Security Agency. Not news in itself, this announcement contains several details of some significance:

A California aircraft manufacturer is adding 50 women workers a day, without pre-employment training, for riveting, rivet bucking, dimpling, spray painting, pasting and gluing, shearing, filling, spot welding, arc welding, automatic drill press operating, automatic turret lathe operating, and wiring. Ultimately the company expects women to constitute 30 percent of its personnel, a figure well above prevailing levels.

In Milwaukee women taxicab drivers are being hired to replace men active in defense industry or in military service. Wives and mothers of present employees are being given first choice for jobs in a San Diego aircraft plant which is putting on 2,500 women. Other relatives of employees are being given second preference. Women who are already residents of the city will receive special consideration also.

In New York and Connecticut employers report difficulty in getting women to enroll for pre-employment courses, partly because of the women's reluctance to undertake five weeks of training without pay. The San Diego company, incidentally, begins training after employment.

•

In-Plant Training Program Launched by WPA

To accelerate the transfer of WPA workers directly to defense jobs, the federal work-relief organization has launched an in-plant training program in 250 factories in 70 key cities.

Selected WPA employees—skilled, semi-skilled and those having mechanical aptitude—are referred directly to defense industries that already have felt labor shortages. These candidates receive a short period of intensive training on specified job operations under the guidance of the plant's supervisory personnel. The trainees' wages are paid during the training period, which cannot exceed 160 hours, by the WPA. At the end of that time, the candidates are transferred to the plant payroll if they meet minimum standards of skill.

This plan is the result of the organiza-

WHEN YOU HAVE THEIR

GOOD WILL

-- YOU GET THEIR

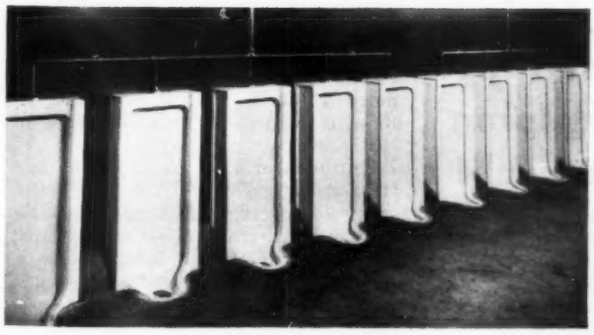
BEST WORK

IN TIMES of increased activity, it is doubly important to give your plant personnel modern sanitary washroom facilities. Their good health and good spirits are vital to efficiency.

When you install plumbing and heating equipment, remember that *first quality* always pays its way! Kohler products cost no more than others of uncertain merit — they serve better, last longer and save maintenance money.

Kohler fixtures and fittings are made, assembled, shipped — all at one central point. They are engineered for easy installation and certain service, made to endure. . . . Write for latest Industrial Catalog TODAY. . . . Kohler Co. *Founded 1873.* Kohler, Wisconsin.

NATIONAL DEFENSE CANNOT WAIT



Square D Manufacturing Co., Milwaukee, Wis., has Kohler plumbing.

•

Left—Battery of **BRANDON** vitreous china urinals.

•

Right — **SUNNYBROOK** vitreous china drinking fountain.

KOHLER OF KOHLER

PLANNED PLUMBING AND HEATING

KOHLER CO., *Dept. FM-11*, **Kohler, Wisconsin**
Please send me NEW Industrial Catalog.

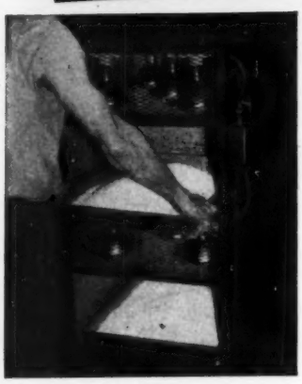
NAME_____

ADDRESS_____

SAVED! 45-Minutes Drying Time!

with WESTINGHOUSE RADIANT HEAT DRYING LAMPS

HOW MUCH TIME COULD YOU BE SAVING?



Westinghouse Drying Lamps are also being used to dry paints, lacquers and enamels faster and better.

One Case Out of Thousands!

Whatever type of heating or drying problem you have in *your* plant, chances are Westinghouse Radiant Heat Drying Lamps can save time and money for *you*, too. Case illustrated shows ten R40 drying lamps removing moisture from granulated cellulose acetate prior to loading in press. Drying requires *15-minutes*, replacing a steam dryer requiring *one hour*.

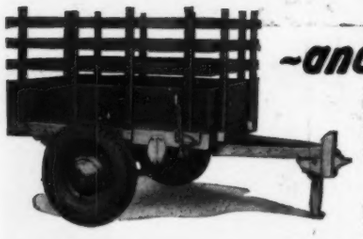
Faster! Cheaper! Easier!

It's easy to see why these lamps do a faster, better, more economical job: the infra-red rays penetrate *deep down*, starting the drying or heating process from the inside *instantly, uniformly, efficiently*. Easy to use as light bulbs; no costly insulated ovens or pre-heating required. See your local Westinghouse Mazda Lamp distributor or write for folder, Westinghouse Lamp Division, Bloomfield, N. J.

Westinghouse

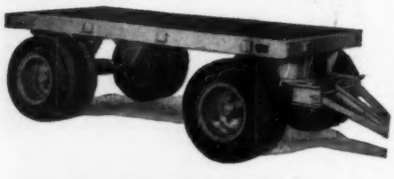
RADIANT HEAT DRYING LAMPS

A Soldier Still Travels On His Stomach!



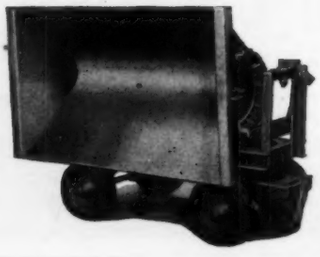
-and EWC

Engineered Hauling Equipment Is Helping Him Do A Better Job!



Among the hundreds of special handling problems solved by EWC Engineers, equipment has recently been produced to haul supplies and materials in various Army training camps.

Our regular line of Materials Handling Equipment, plus the innumerable variations worked out by our designers, puts us in a position to help you meet every hauling job efficiently and economically. Let us work with you, just as we have so successfully worked with thousands of others.



WRITE FOR BULLETINS, Prices, and Helpful Suggestions applying to your own special needs.

EWC TRAILERS

ELECTRIC WHEEL CO.

Dept. FA Quincy, Ill.

tion of WPA's training activities and is conducted under the newly created WPA Division of Training and Re-employment. In the first three months of its operation, the program resulted in the placement of 67,000 men and women in private employment, mostly on defense work.

The United States Employment Service of the Federal Security Agency cooperates with the WPA in locating areas where labor shortages exist.

•

Machine Tool Survey Published in Los Angeles

Eight thousand machine tools in more than 400 metal-working shops in the Los Angeles district are classified in a pamphlet recently issued by the Industrial Department of the Los Angeles Chamber of Commerce.

Pamphlet is a recapitulation of the results of a survey published last March, which was made to tell defense officials how many machines of various kinds are available in the Los Angeles area. It is in graph form that shows at a glance just where a manufacturer or prime contractor can find a needed machine without delay.

Other communities might well take a leaf from the book of the Los Angeles Chamber of Commerce, and compile similar statistics, if this information is not available at the local Contract Distribution Division office.

•

Stabilization of Wages Gets Two Setbacks

While the specter of inflation holds the nation transfixed, America's economic experts quarrel among themselves over the means by which to slay the monster.

Control of wages is the question at the heart of the conflict. Conservative economists hold that without wage stabilization there can be no possibility of effective price control, without which inflation cannot be averted. This view is also held by some New Deal stalwarts, such as Federal Reserve Board Governor Marrimer S. Eccles, and likewise has the apparent support of Price Administrator Henderson.

On the other hand, Isador Lubin, chief labor statistician of the Office of Emergency Management, believes price control can be effected without wage control, and doubts that wage increases are responsible for inflationary price trends. Lubin holds that prices have increased in anticipation of higher wage demands.

"Since August, 1939, price increases have been sufficient to cover the cost of substantial wage increases granted in the past, as well as demands for wage rises that may occur in future months," Lubin told the House Banking Committee at a recent hearing on the price control bill. Increase in average hourly earnings of 17 percent for the period from 1937 to date have been almost equaled by increased hourly output, Lubin declared.

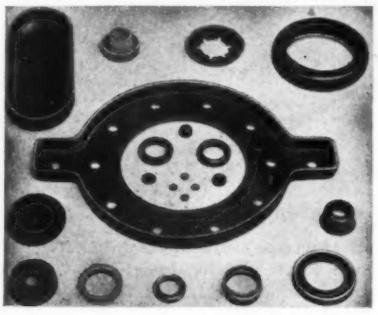
"If you fix prices you automatically prohibit price rises in anticipation of

SPARTAN LEATHER WIDELY PREFERRED FOR PACKINGS

The many advantages of leather as a material for packings — flexibility, long life and economy — are emphasized in Spartan leather used in most packings manufactured by Graton & Knight Company.

Spartan leather is made from carefully selected hides tanned by an exclusive combination process that produces an exceptionally tough packing leather that has highest abrasion and heat resistance. It is not affected by commonly-used pressure mediums, and will not dry out hard and brittle.

Manufacturing of Spartan Packings is done with tools, moulds and presses which Graton & Knight designed and built expressly for this purpose. Many dozens of standardized treatments permit selection of the one treatment that will develop the best packing for the specific job. Whether the service is light or heavy-duty, there is a



Special Shapes of G & K Packings

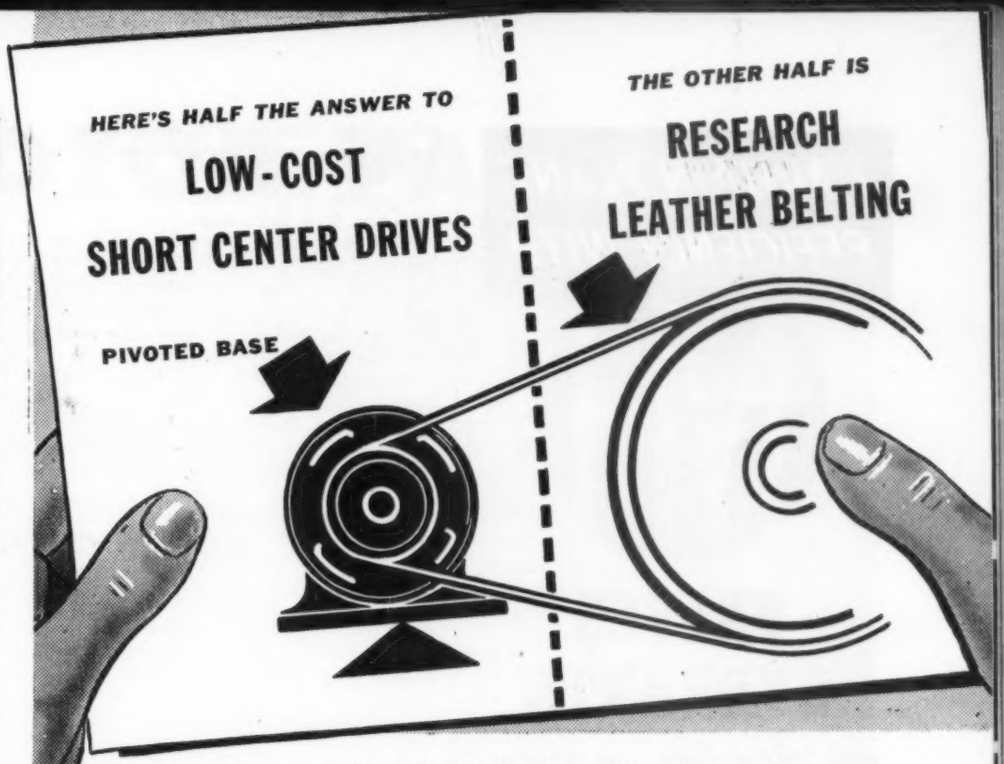
Spartan Packing that will operate efficiently and with long life.

Among the 10,000,000 or more packings manufactured each year for Graton & Knight customers are sizes ranging from ¼-inch cups to 50-inch flanges, and special shapes such as those illustrated.

A competent engineering department offers the type of service that for many years has proved helpful to both designers and operators of equipment using packings.

Graton & Knight's easy-reference Packings Catalog is available by writing Dept. G, Worcester, Mass.

(Advertisement)



To save money on installation, belt and bearing replacement . . . to save space . . . and to increase production by automatically regulating belt tension — select one of the well-known makes of *pivoted motor base.*

And to get the *most* out of your pivoted base drive — use *Research Leather Belting . . .*

SAVINGS FROM 4 IMPORTANT FEATURES

1. **MORE GRIP.** The exceptional frictional surface built into Research gives you added production — 3% guaranteed.
2. **LESS STRETCH.** Research — with 50-75% less stretch — requires fewer adjustments of base . . . lowers maintenance costs.
3. **MORE FLEXIBILITY.** Research is so pliable that it hugs even small pulleys . . . eliminating slip . . . adding production.
4. **STRONGEST PLY ADHESION.** Tension-cementing eliminates ply separation despite constant flexing over small pulleys.

RESEARCH GIVES YOU:

More production		Better grip
Less maintenance	*DUE TO*	Less stretch
Longest belt life		Research tanning and finishing

A more expensive belt can't give you more.
No other belt can give you as much.

WRITE US for our new free bulletin on "The Right Combination for Short-Center Drives."

Graton & Knight Belting turns more pulleys than any other make in the world!

GRATON & KNIGHT CO.

Tanneries and Manufacturing Plant at
WORCESTER, MASSACHUSETTS

GRATON AND KNIGHT

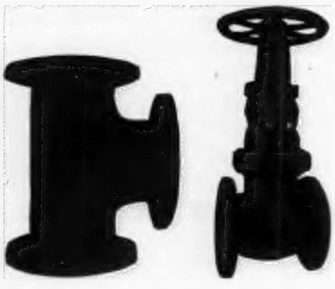
We are the only leather belting manufacturer with complete nationwide service facilities. See page in THOMAS' REGISTER.

Complete line of flat leather belting . . . round belting . . . cements, dressings . . . lace leather . . . Spartan Packings . . . textile leathers.

MAINTAIN PLANT EFFICIENCY WITH

M&H

VALVES
HYDRANTS
and pipe line accessories



M & H Gate Valves are cast iron body, bronze mounted, with double-disc parallel seat or solid wedge top, non-rising stem or outside screw and yoke. They come either with flanged or screwed connections. Valves for fire protection lines are marked "UA-FM" to denote approval of both the Underwriters and the Factory Mutuals.

FIRE HYDRANTS

M & H fire hydrants are revolving head, dry top, bronze mounted. They also are approved by "UA-FM". Entire main valve assembly is removable through barrel without digging. Special Traffic Model is fitted with breakable bolts and stem coupling, designed to break at ground line under impact. Repairs are made simply by renewing bolts and coupling, without shutting off the water.

Square Bottom Gate Valves	Extension Stems
Traffic Model Fire Hydrants	Shear Gates
Check Valves	Sludge Shoes
Flap Valves	Flared Fittings
Tapping Valves	B&S Fittings
Mud Valves	Wall Castings
Floor Stands	Tapping Sleeves
	Valve Boxes
	Special Castings

M&H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

future wage increases," he declared, adding that this would automatically set a "ceiling" on wages.

Chairman Henry B. Steagall, Alabama democrat, took sharp issue.

"You are assuming labor is going to be good and not ask for more, but we're not legislating on that presumption," Steagall told Lubin. "You are asking us to tell industry to stop right here, and inviting labor to get all it can."

Another setback for the advocates of wage stabilization came meanwhile from the protracted hearings in Chicago where a Presidential fact-finding board reviewed the demands of the five operating brotherhoods of America's railroads for a 30 percent increase in basic rates of pay, as well as the plea of 14 non-operating unions which sought increases of 30 to 34 cents an hour.

A "Cost of Living Bonus" plan, proposed by F. D. Gurley, representing the railroad managements, was promptly attacked by two of the foremost union officials.

The plan contemplated a "composite index," using the number of points of rise or decline in the Cost of Living Index and half the number of points of rise or decline in gross railroad revenues to govern increases on which present basic rates of pay would serve as a floor, with a ceiling fixed at not more than a 15 percent increase on the first $30 a week of earnings. Adjustment would be made quarterly. If put immediately into effect, the plan would result in an estimated 6 percent increase in earnings up to $30 a week.

Both George M. Harrison, president of the Railway Clerks Union, and A. F. Whitney, president of the Brotherhood of Railroad Trainmen, sharply criticized the proposal.

"The bonus plan proposed is deceptive in its operation and unsound as a means of adjusting wage rates," said Harrison. "It ignores all other relative factors in wage fixing and perpetuates inequalities of treatment compared with other wage earners who now enjoy wage increases."

Whitney was equally outspoken in his opposition. Neither of the union leaders condemned the cost of living adjustment plan as such, however, but rather attacked Gurley's, particular proposal.

•

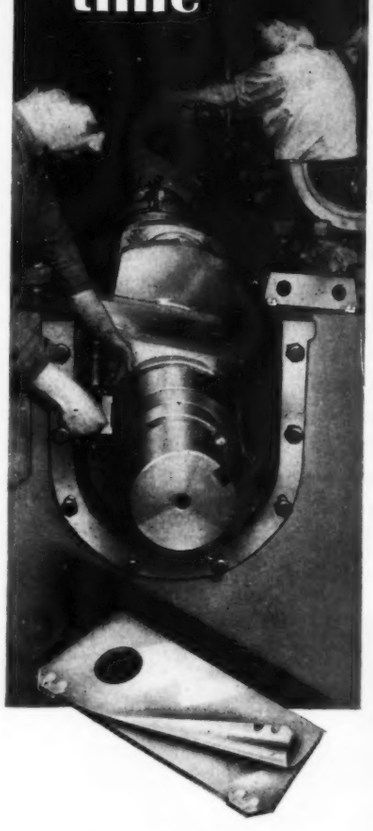
Legal Curb is Asked on Labor Rackets

From one of the newest members of the Upper House comes one of the most sweeping of legislative proposals to place a national restriction on the activities of labor leaders.

Senator W. Lee O'Daniel, Texas democrat, is the author of a joint resolution, "proposing an amendment to the Constitution of the United States, relative to freedom to work." Extremely brief, the measure, if ratified by three-fourths of the states, would apparently spell doom for the closed shop.

The text of the resolution affirms that "no person shall be denied employment because of membership in or affiliation with or resignation from a labor union,

release machine time



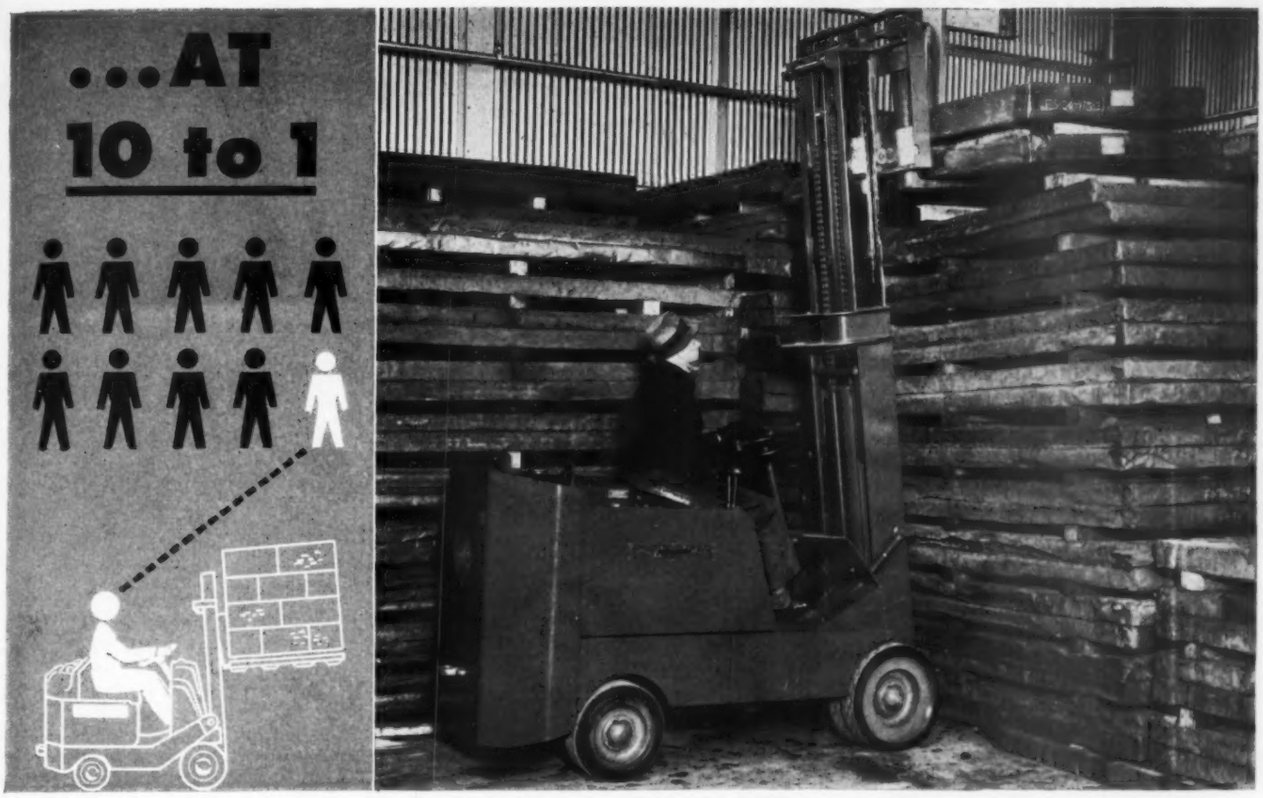
Increase available machine time 20 to 30% by designing your product for LAMINUM shim adjustment. Permits greater flexibility in assembly. ...This gas and Diesel engine builder simply *peels* his Laminum shims. Provides quick accurate clearance for main and connecting rod bearings and compressor cylinder crossheads. Correct adjustments in assembly and for engine life! Note the babbitt-tipped type of shim used...for oil and pressure seal. • *Shims (.002 or .003 in. thick laminations) cut to your order. For repair or maintenance work, get stock sheets or strips from your mill supply dealer.*

Laminated Shim Company
INCORPORATED
54 Union St. Glenbrook, Conn.

Write for file-folder of shim application photos — and Laminum sample.

LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT
1663

TOWMOTOR PAYS OFF



● Towmotor is a "sure thing" to set new records for speed, capacity, low cost in any plant now handicapped by "plow horse" methods of materials handling. This powerful "one man gang" moves more tonnage, faster and with greater safety than any ten men on your payroll . . . releasing valuable man power for more productive work. And here's the "pay off" —Towmotor operates for less than one man's wage.

It's a fact, ten men couldn't begin to do many jobs Towmotor handles with ease . . . lifting 1,000 to 10,000 pound units, carrying them at speeds up to 10 miles per hour, stacking capacity loads up to 25 ft. high. See what this 10 to 1 performance means in actual plant operations—

Towmotor swiftly unloads freight cars of materials packed for mechanical handling—often in less than an hour. In the warehouse, unit-load stacking to near-ceiling heights expands storage capacity . often as much as 50%. Hustling multi-ton loads to men and machines, "spotting" for action, Towmotor keeps production rolling, ends costly rehandling by skilled workers. Short wheelbase, compactness provide for fast, safe work in crowded quarters. From one department to another, into storage, through assembling of orders and carrier loading, Towmotor speeds up handling, ends "waste motion." And Towmotor, "the machine that never gets tired," works 24 hours daily.

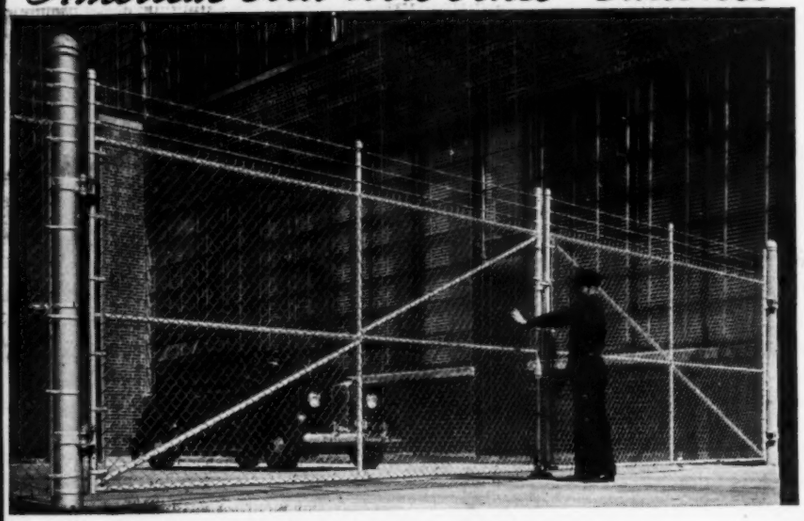
Now's the time to seek out "non productive" costs, prepare for competitive days ahead. It's *better* than 10 to 1 Towmotor engineers can help you.

TOWMOTOR COMPANY
1270 E. 152nd St., Cleveland, Ohio

Let TOWMOTOR CLEVELAND *take the load off your hands*

PAGE FENCE

America's First Wire Fence—Since 1883



PROTECTION—ON THE LINE

★ The name PAGE not only identifies dependable property line protection but it is the symbol of quality that safeguards the investment. In Page Fence you get an assemblage of superior qualities, many of them exclusive. Page Winged Channel Posts are stronger and longer lasting. The semi-flat weave makes possible a taut fabric of maximum strength. All parts of the supporting structure are expertly made. And Page Fence is erected by technically-trained, long-experienced, responsible total business men. Write for "Fence Facts," to PAGE FENCE ASSOCIATION, Monessen, Pa., or Bridgeport, Conn., New York, Pittsburgh, Atlanta, Chicago, Denver, San Francisco.

A PRODUCT OF PAGE STEEL & WIRE DIVISION—AMERICAN CHAIN & CABLE COMPANY, INC.

Revised
Up-to-date
3rd Edition

TIME AND MOTION STUDY

And Formulas for Wage Incentives

By STEWART M. LOWRY
Director of Industrial Relations, Procter & Gamble Co.

HAROLD B. MAYNARD
President, Methods Engineering Council.

G. J. STEGEMERTEN
Staff Supervisor, Time Study and Methods, Westinghouse Elec. & Mfg. Co.

432 pages, 6x9, 151 illustrations, $5.00

How to make

TIME AND MOTION *studies*

Here's your opportunity to get the fullest, modern view of this great tool of industry, or to master any of its details . . .

. . . for your needs as a plant executive interested in its possibilities for improving production and lowering labor costs, or as a prospective or practicing time-study man.

From this book you can get everything necessary to develop a system that may be applied in any industry, using simple and inexpensive apparatus, securing quick results, and operating with minimum interference with production and workers' mental attitudes.

This complete, illustrated manual shows you:

—functions of time and motion study
—scientific fundamentals
—what makes a good time-study man
—equipment and how to use it
—how to make observations
—how to analyze the results
—how to standardize jobs, and set up formulas, etc.

Now meets needs of methods-study men

Especially important in this edition is the greatly enlarged section on motion study, giving many details on analyzing the process and operations, eliminating unnecessary work and motions, and installing simple, practical work-reducing methods.

EXAMINE BOOK 10 DAYS FREE—SEND THIS COUPON

McGRAW-HILL BOOK CO., INC., 330 W. 42nd ST., N. Y. C.

Send me Lowry, Maynard and Stegemerten's Time and Motion Study for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address ..... Position .....

City and State ..... Company Fac-11-41

(Books sent on approval in U. S. and Canada only.)

or because of refusal to join or affiliate with a labor union; nor shall any corporation or individual or association of any kind enter into any contract, written or oral, to exclude from employment members of a labor union, or persons who refuse to join a labor union, or because of resignation from a labor union; nor shall any person, against his will, be compelled to pay dues to any labor organization as a pre-requisite to or condition of employment."

Shortly after he introduced this proposal, O'Daniel revised its language to require the ratification of conventions in the State, rather than ratification by the legislatures.

"I believe it would be difficult to get the legislatures in some of the states to ratify this resolution, because there might be too many members of the various state legislatures who are influenced by the labor vote," O'Daniel declared. "I believe, however, by submitting this to the sovereign voters of the states it will be ratified."

O'Daniel termed his resolution an attack on "an ugly, dangerous factor in our spotty politics today, the powerful, dominating, labor-union leader racketeer."

"Nobody in the world is more sympathetic toward or more understanding of laboring men and women than I am," O'Daniel said, "for I have done almost every kind of hard, manual labor, and I know what it means to bring home the bacon by the sweat of your brow. So I want it distinctly understood that when I mention the unfairness of labor-leader racketeers bringing about strikes in our defense industries, I am in no way reflecting on the good, sound-minded, and dependable laboring men and women of this great nation."

•

Defense Opens Jobs for the Handicapped

Special training courses, conducted by the Bureau of Rehabilitation of the Pennsylvania State Department of Labor and Industry, are preparing the physically handicapped workers of Pennsylvania for jobs in defense industry.

Mark M. Walter, state director of Vocational Rehabilitation, reports the employment of 10 physically handicapped persons in the drafting room of the Westinghouse Transformer Division at Sharon, Pa., as an example of the progress of the rehabilitation program.

A year ago most of the candidates were either doing work that offered little chance for advancement or were unemployed. Then they were enrolled in special training courses in the Williamsport Vocational School of Williamsport, Pa., and today are helping to meet the nation's shortage of trained draftsmen at the Sharon branch of the Westinghouse Electric & Manufacturing Company.

The 10 students, including one girl, are a part of a total of 839 handicapped people in Pennsylvania who have been placed in industrial employment during the past year as a result of the Bureau's program. Some 1,000 others are now receiving training in preparation for job placement.